THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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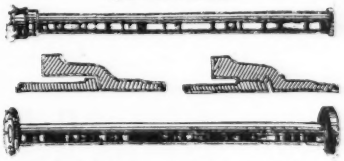

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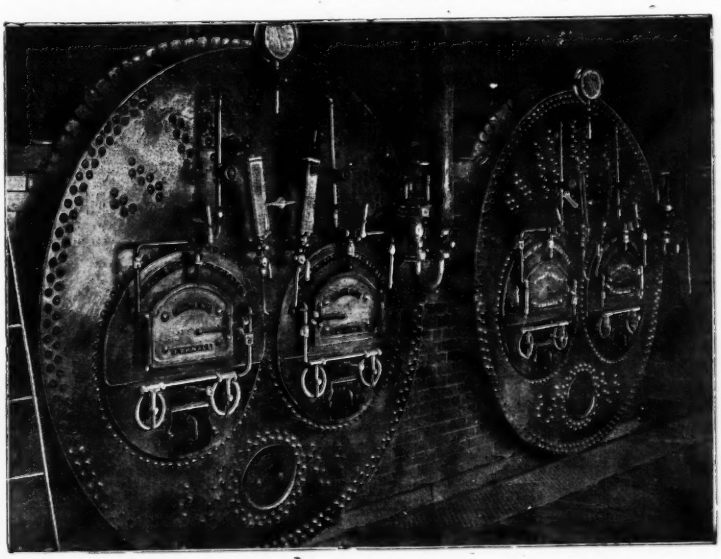

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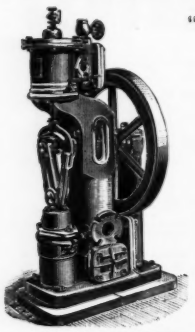

Fig. 705. "SINGLE RAM" STEAM-PUMP.

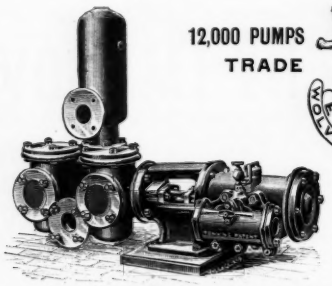

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

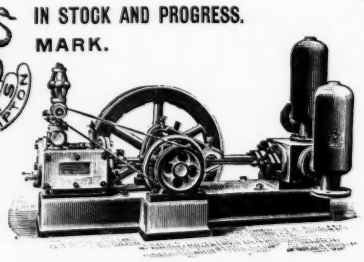

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

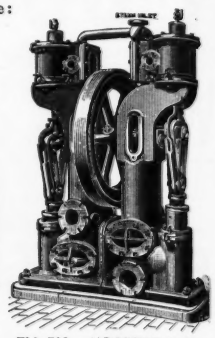

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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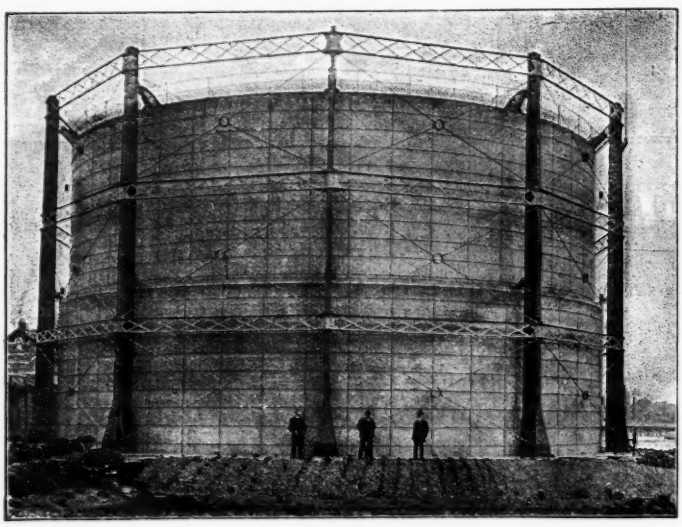

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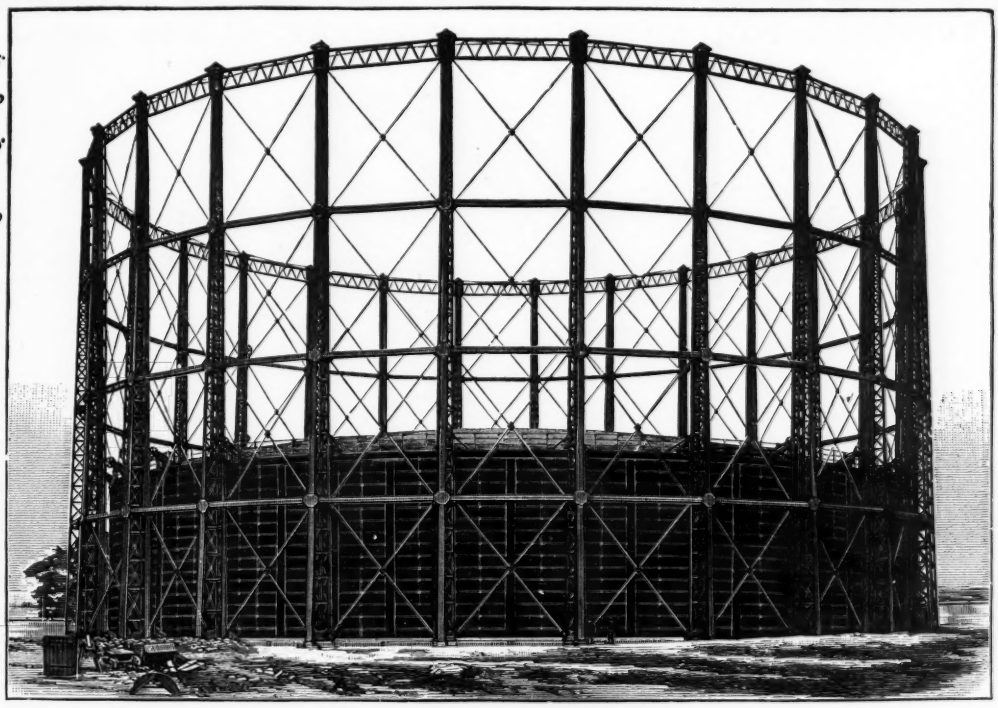

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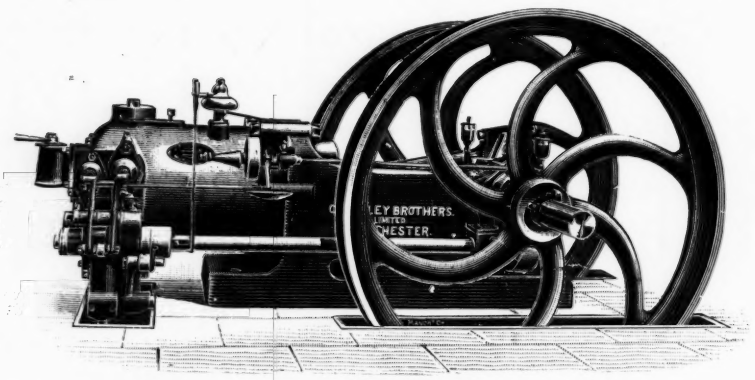

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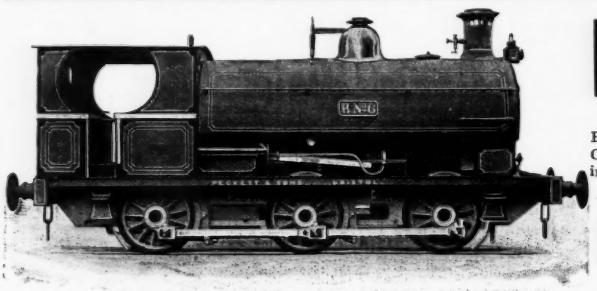

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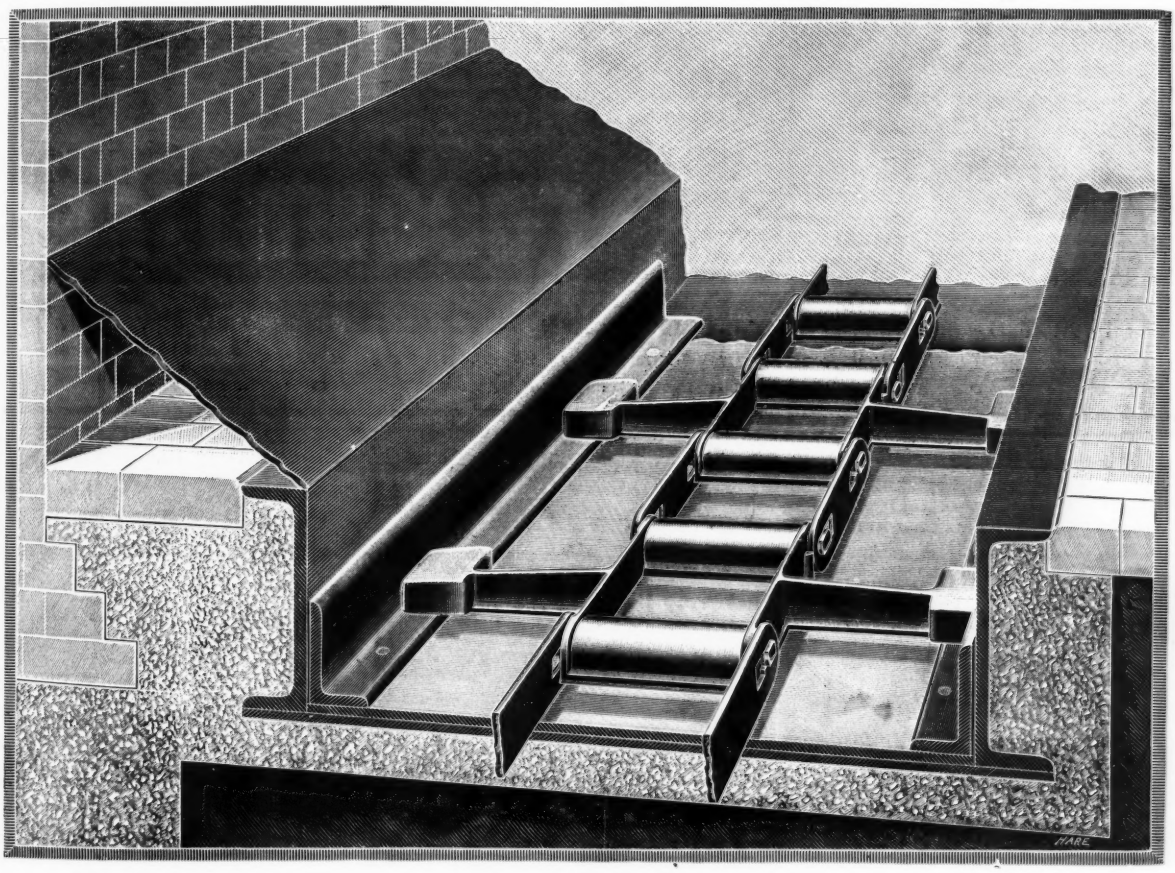

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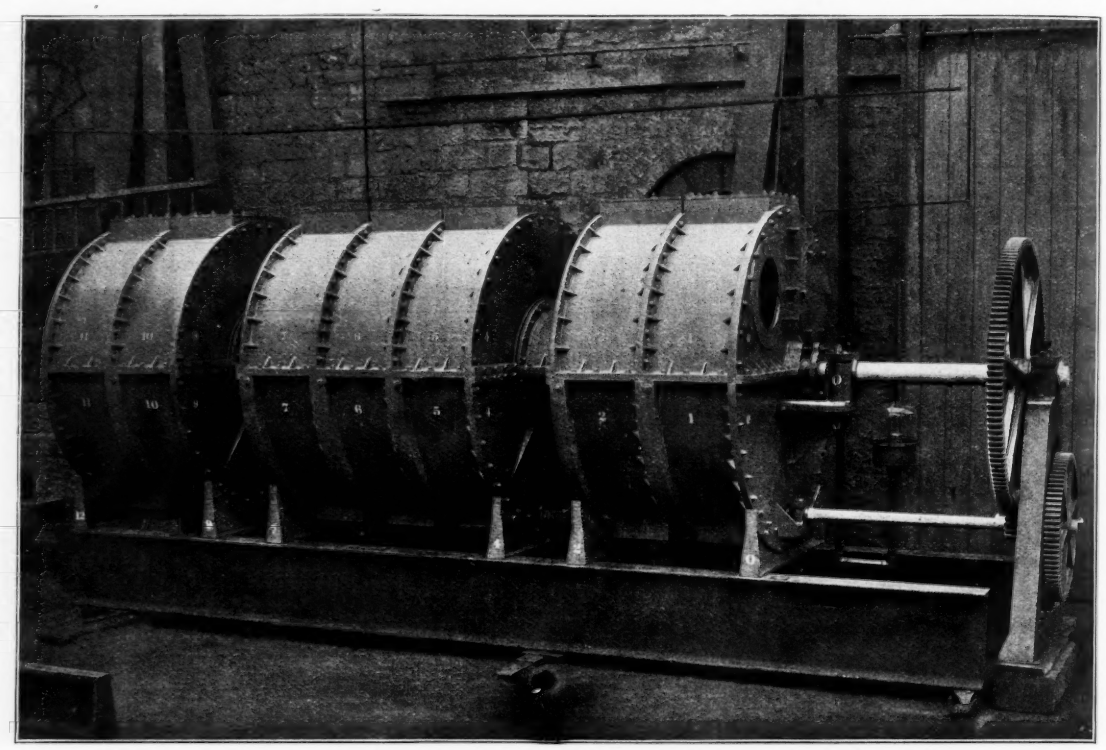

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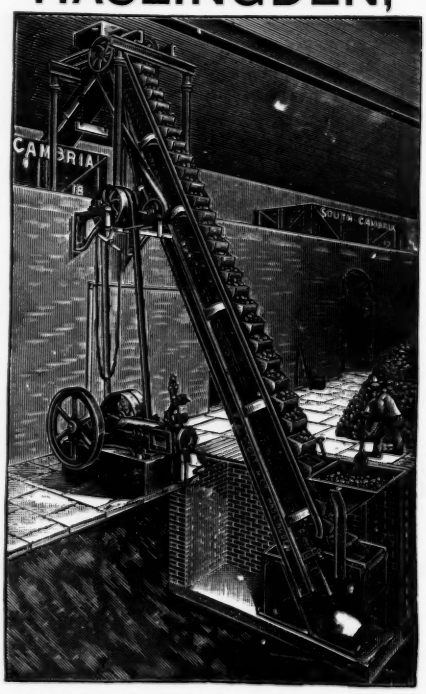

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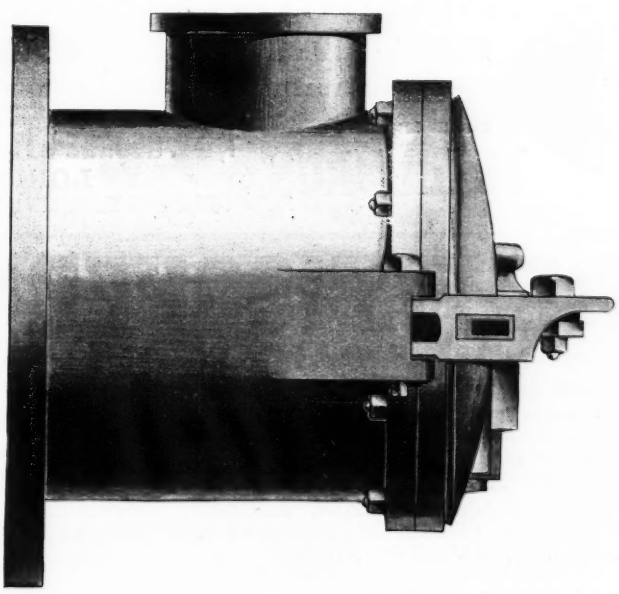

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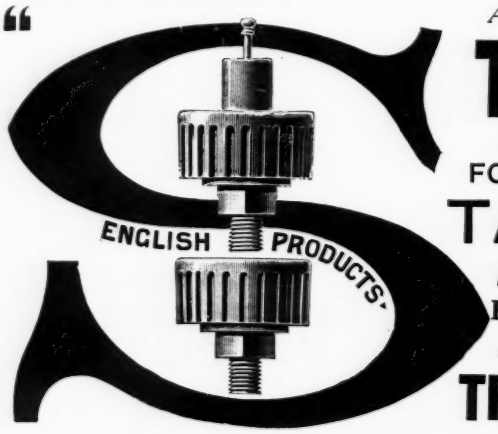

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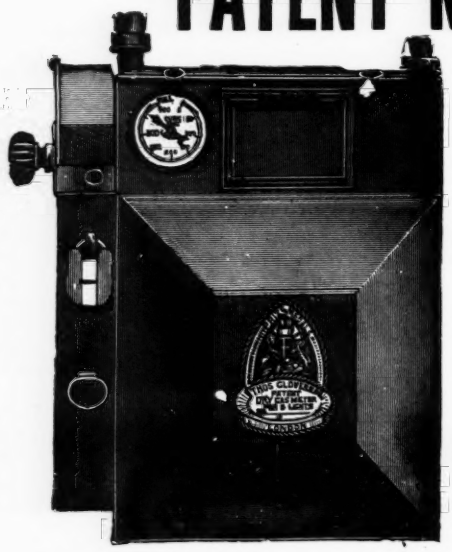

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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXIII., No. 2101.—TUESDAY, AUGUST 18, 1903.

EDITORIAL NOTES.

The South Metropolitan Meeting.

THE South Metropolitan meeting last Wednesday was very much like most of its precursors—that is to say, it was fairly well attended, and the proceedings were smooth and devoid of incident. The Chairman—Sir George Livesey—had nothing very fresh or startling to say; and though at one passage of his interesting speech he almost threatened to make some severe remarks about his ancient antagonists of the London County Council, he refrained from enlarging upon the guarded language of the report. This reserve, seeing that the Company and the Council are at law over the most acute of their differences, was right and proper; but it must have been pain and grief to so peaceful a man as Sir George Livesey, to keep silence on the point which has touched him so closely! Instead, the Chairman dilated upon the smallness of the Company's increase for the half year, which he attributed to the spread of improved and economical means of burning gas. It appears that the Company have now from 60 to 70 "mantle men," who not merely keep the incandescent burners in the district in good order, but act as missionaries of the Company's cause, which is that of material "sweetness and light" in a region that very sorely needs enlightening. Speaking later, Mr. Carpenter, the Chief Engineer, made the interesting statement that the Company's mantle maintenance system is having the excellent effect of superseding itself. After a few months, it appears, many of the consumers learn as much about the management of gas as the officials can teach them; and thereafter they look after their burners themselves. This is one satisfactory result of the system.

Naturally, the Chairman had a good deal to say about the remarkable strength of the Company's financial position. He told how much money they have to share out and put by; and Mr. Bush, the Secretary, gave more figures to the same effect. This confession of wealth led up to the promise that, if nothing unforeseen happens to prevent it, there will be a substantial reduction in the price of gas after the end of the year. Sir George Livesey is persuaded that gas coal is dear, and is more likely to become cheaper than dearer. It is true that the South Metropolitan Company are now in an excellent position for buying in the cheapest market; but, with all the deference due to the superior knowledge and good judgment in such matters of the South Metropolitan Chairman, we venture to think that the wish is father to this thought. There is a middle course between coal becoming either cheaper or dearer; and that is, to remain pretty much at its present value. This, in our opinion, is the most likely event. The fall in the price of gas coals last season was not nearly so great as was generally looked for; and prices have been hardening all this year. Somehow, there is a belief abroad that the coalowners and the colliers between them have at last succeeded in getting the trade in hand, and that the starvation prices of the past, when this irreplaceable national asset was being sacrificed to nobody's benefit, are not very likely to recur. If this impression is correct, then the old-fashioned doctrine of *laissez faire* has received its *quietus* in yet another field of national industry; and Protection, new style, has won another victory without anybody caring to draw attention to the fact.

Of course, Sir George Livesey entertained and reassured his auditory on the subject of the Company's profit-sharing commitment—or the "co-partnership," as he wished to call the arrangement. He was wise to do this, for it has been loudly proclaimed in many quarters that profit-sharing does not pay employers. Obviously, it is a good deal in the pockets of the South Metropolitan workpeople, according to the accounts. There is great comfort in the statement of how much every individual worker for the undertaking holds, as an average, of the capital; but all this might be true without the Company being any the better served for the extra money paid out for the "fancy." Upon this question, the Chairman was very firm. Maintaining, as he was bound to do, that every business arrangement in the world subsists because, and only because, it is mutually advantageous to both parties to the deal, he claimed that this can truly be said of the South Metropolitan co-partnership. But it is a matter that is not susceptible of mathematical proof. It would be quite impossible to show that any workman does 5 per cent. more for every 5 per cent. increment of individual gain; but it possible to feel when one has to do with a willing horse or with a slug. Moreover, no man in the Company's service can feel that he is being "put upon," or that there is any intention on the part of his employers of treating him as mere human "scrap" when he has done his best. Work goes well under such conditions, and a small increment of outlay is easily recouped.

Power was taken at the meeting to increase the capital by £250,000, as to which there was quite an interesting little discussion across the table, in the course of which electric lighting and Mond gas were both mentioned. It transpired, moreover, that the Directors are converted to the policy of working up their own tar; and part of the additional capital will go for the necessary plant. This is quite a new departure for the Company. The evidence of the expediency of enterprise that converted the Board must have been remarkably strong. Circumstances, no doubt, alter cases; and it would be interesting to know how far the Company are likely to go on their new "side line." It is clear that they are finding it to be to their advantage to be more self-supplying and self-sufficing every year that their business grows; and possible weak spots in their dealings with a self-seeking outside world need strengthening.

The Report and Accounts of the Commercial Gas Company.

THE report of the Directors and the statement of accounts relating to the last half-year's working of the Commercial Gas Company will be found in another column. The capital now appears on a converted basis uniform with that of the two other London Gas Companies. The net profit amounts to £66,332, which with the balance of £10,035 brought forward makes a net revenue balance of £76,367. Out of this sum £8068 has to be paid for interest, and £3444 for stamp duty on the increase of nominal capital; which leaves £64,855 available for dividend. The Directors recommend payments after the rate of £5 4s. per cent. per annum upon the ordinary 4 per cent. stock of the Company, and £5 per cent. per annum upon the 3½ per cent. stock. The passing of the Company's Act making provision for the testing of the Company's gas is mentioned in the report without comment. Mr. Henry Edward Jones, the late Engineer of the Company, has been elected to a seat at the Board. The Directors have decided to issue the remainder of the capital authorized by the Act of 1875, offering the stock in the first instance to the consumers and employees of the Company. It appears to be the policy of the Board to increase the Company's coal-carrying squadron; an outlay of £14,165 for new steamships being entered in the capital account. There is a considerable expenditure going on for prepayment meters and fittings. It would be interesting if the Chairman—Mr. W. G. Bradshaw—would take the opportunity, while speaking on the accounts, of saying how the Company stand affected by the immigration of aliens into their district, as to which the Royal Commission appointed to consider the subject have just offered some very strong observations. The maintenance of incandescent mantles appears in the revenue account, which also gives the numbers of meters and stoves in use on June 30. There has been an increase of 1·6 per cent. in the quantity of gas accounted for, which is satisfactory. The progress of rate-aided electric lighting explains a reduction in the number of public lamps, and possibly also some of the increased burden of rates. Carbonizing wages are less; and a substantial amount has been appropriated to repairs and maintenance. Altogether, the Company have had a very prosperous half year; and the proprietors can feel assured that their undertaking is developing satisfactorily under the new

conditions of existence, statutory and personal. Here again the reduction of illuminating power has not produced those wonderfully increased consumers' demands predicted in the circumstances.

Ignorance in Parliament and Elsewhere.

Two matters of surpassing importance connected with the parliamentary proceedings of the session which has just ended, received considerable attention at meetings of Suburban Gas Companies last week. It was the duty of Sir George Livesey to explain to the proprietors of the Crystal Palace Gas Company the causes which operated to bring about the rejection in the Upper House of the most valuable parts of the Bill which was promoted by them, and the subsequent withdrawal of what was left. This he did in a manner which, under the circumstances, was conspicuous for its moderation. The Bill has been followed with such close interest that, on its main objects and the story of the happenings in connection with it, readers are well informed. But this is the first time since the fate of the Bill was known that its author has publicly had an opportunity of having his say on the matter. Sir George neatly sums up the points that ended in the deplorable overthrow of the measure—"deplorable" because we believe it would have done more to vitalize the future of gas supply and consumption than any proposal that was brought before Parliament during the session—when he says that "ignorance, prejudice, sus-"picion, and distrust" were at the bottom of it. This is really a sweeping condemnation of the Local Authorities who opposed, and of their tactics in conducting their opposition. Yet it is not more than is deserved. At the same time, we are not going to leave this statement without qualification, for the application of these four attributes to the whole of the Local Authorities in the district is properly, in our view, one of degree. Ignorance, it may be granted, animated the whole of the opponents; but how "prejudice, suspicion, "and distrust" came into existence among Authorities who, with the consumers in their areas, have been treated with such openhandedness as have those in the district of the Crystal Palace Gas Company, demands a little consideration.

Chief among the opponents were the London County Council; and yet they had no reasonable right to oppose—their jurisdiction in regard to gas supply being merely co-extensive with the areas of the three London Gas Companies, and no more. A careful following of the proceedings in Parliament on the Bill leads to the opinion that prejudice—consummate prejudice—born of the little success the Council have met with in opposing the progressive gas policy in South London, was responsible (more than any ignorance on their part) for the particular action they took in connection with this Bill of the Crystal Palace Gas Company. Their move in lodging a Bill in the past session for 14-candle gas in North London supplies some measure of proof of this. The "prejudice" in Sir George's indictment we therefore believe to be the County Council's particular property, and that whatever "suspicion" or "distrust" exists among the Local Authorities within the Company's area has been engendered by the County Council's, or their officials', prejudice, quite as much as by the Local Authorities own ignorance of gas matters. If this be so, we are sorry the latter have come under such influence.

In his speech to the shareholders, the Chairman illustrated the character of the evidence with which the County Council played upon the "ignorance" of the Lords Committee, who showed such a lamentable lack of appreciation of the questions brought before them; and the report (as published elsewhere in this issue) will not form particularly pleasant reading for Dr. Clowes, the County Council's adviser in these matters. However, there will be some satisfaction in the gas industry in learning that Sir George and his colleagues are not discouraged by this first rebuff, and that they do not intend to give up the struggle for greater freedom in gas supply. Indeed, they regard the complete acceptance by the House of Commons of their proposals as being most encouraging; and the Chairman takes such a happy view of their success in the Lower House that he believes, if they had asked the Commons Committee for more, they would have obtained it. It cannot be said that "prejudice, sus-"picion, and distrust" have characterized Parliament in their dealings with Sir George Livesey's gas schemes in the past. It has been, on the whole, one long record of confidence; and we look, without the slightest misgivings, to the proposals contained in the Crystal Palace Bill of the past session eventually receiving the complete endorsement of both Houses.

The other question arising out of the parliamentary proceedings of the session was also one in which the Crystal Palace Gas Company were interested, but jointly with the Bromley Gas Company; and it has reference to the eccentric behaviour of Parliament in the matter of granting and refusing clauses to gas companies in connection with municipal competition and damage occasioned by electrolysis. Sir George Livesey did not touch upon the subject at the Crystal Palace meeting, but Mr. Alexander Dickson did so, in a full and energetic way, at the meeting of the Bromley Gas Company. It will be remembered that, notwithstanding the several precedents, the two Companies failed to get the Bermondsey clause inserted in the Beckenham District Council Bill a few weeks since; but in connection with the power the Council sought for the construction and working of electric tramways, the Lords Committee, before whom the Bill came, inserted a clause giving the right to compensation for damage occasioned by electrolytic action. The point, however, of Mr. Dickson's very proper complaint is as to the action of the House of Lords in vetoing the clause that had been granted, after complete inquiry, by one of their own Committees. The seriousness of this must not be overlooked by the gas industry. It has been uphill work to get any recognition (scant though it has been up to the present time) of the right of the owners of underground pipes to common justice in respect of this new trouble. The decision of the House of Lords menaces the success of future attempts in this direction; and therefore Mr. Dickson is of opinion, and we fully concur with him, that "gas and water companies "throughout the kingdom ought to take such action as will "ensure that equity should be done." The difficulty is to know in which direction to institute fresh action, unless it be by the weight and influence of a large combination of companies being brought to bear in introducing the matter anew to the notice of the authorities by petition and deputations. At the same time, whatever may be done, until full success is achieved, it is hoped that individual companies will not neglect any opportunity that may present itself for assisting in keeping the agitation alive in the Committee rooms in future sessions. But if anything is to be done in the way of joint action, to try to secure a general and common right to compensation for this particular form of injury, someone must take the initiative, and that as early as possible.

For the Sake of the Gas Worker.

An interesting improvement on the traditional "outing" of gas-works employees was the meeting last Thursday, at the Crystal Palace, of the Directors, the heads of departments, the members of the "Co-partnership" Committees, and a fortunate few of the workmen of the South Metropolitan and Crystal Palace District Gas Companies. Now that so strong a light has been focussed on the usual beanfeast, its origins and consequences, it is gratifying to observe that the adept administrators of the affairs of these neighbouring, and in some respects allied, Gas Companies, have known how to improve the tradition out of all knowledge. At the same time, it was curious to note how very easily on this occasion those for whose pleasure and benefit the gathering was arranged fell in with the ruling idea, and made themselves thoroughly at home with their hosts, as they would scarcely have done had the function been altogether a new thing. Several of the workmen of each Company spoke spontaneously at the dinner, and spoke really well—briefly, and to the point.

This leads one to think the more what a pity it is that the movement has spread so little among Gas Companies. It is not, as Sir George Livesey is particularly anxious to explain, a simple question of the sharing of profits, and nothing more. Profit-sharing schemes, of sorts, have come and passed, but mostly without leaving any lasting impress upon the secular state of the labouring man. This is, as Sir George believes, because too much attention has been concentrated on the immediate question of whether or not the thing pays. Of course, this is the starting-point; and, unfortunately, when both employers and employed are heedless of all ulterior considerations, it proves in the majority of cases the terminus also. When any proportion of the profits of a business are paid out to the workpeople, they are merely additional wages, and as such do no lasting good to either party. Something more is needed to engage the

workman's permanent interest, and help him to an increase of self-respect and a fuller realization of citizenship. All the world knows how this requirement is supplied in the present instances. It is worth taking note that the Crystal Palace District Gas Company's experience is bettering that of the older concern, which is one of the strongest proofs yet given that the movement is on the right lines.

When one remembers the immense tedium of every-day working existence in towns, while yet the life of the town sharpens the nerves of men, how precious seems any remedy that offers to bring Hope back to the toiler! When the labourer is still attached to the soil, and passes his days in the great air of the fields, he is a partaker of the peace in which Nature works. All observers of life notice this fact, though they attach meanings to it that differ as widely as their own temperaments. To some superficial witnesses, the countryman is simply stupid, which is far from being the whole truth. The town labourer is more neurotic; and having usually no prospect of acquiring higher interests in life, he drinks and bets. With the beershop always at his elbow, and the halfpenny tipster ever being forced upon his attention and appealing to his concupiscence, the man is continually being tempted far beyond his strength to resist. How would those respectable Pharisees who sniff at the beery workman like to live for a day as he has to live all his laborious life long? The great question about this poor helot of our social system is how to place in his breast a larger hope than that of picking out "the winner."

In this connection, attention should be drawn again to the striking success of the South Metropolitan gift of the extra quarter of an hour for the men's breakfast time. This also is enjoyed by the Crystal Palace District men; and there is nothing that they value more. When the boon was first granted to the South Metropolitan workers, it was hailed by the "JOURNAL" as a really great amelioration of their lot. Experience has abundantly demonstrated the justice of this view; and it is again a cause of wonderment to us that Directors generally have been so behindhand in adopting the rule. A little more fellow-feeling, and a better personal acquaintance with the actualities of the workman's life, would, we are sure, bring it home to the consciences of these good, easy gentlemen, that half-an-hour is all too brief a space for a man to get his breakfast in comfortably. If they would inquire of their engineer what goes on in the shops just before the hour is expected to strike, they would agree that never so kindly a lightening of the yoke of toil could cost less.

The Accident on the Paris Metropolitan Railway.

THE dreadful calamity that has overtaken the Parisians, in connection with their new underground electric railway, suggests many questions and reflections. So far as readers of the "JOURNAL" are specially interested in the terrible tale, which filled the newspapers last week with more or less pertinent comments on the perilous nature of strong electric currents, it is only with respect to the point of comparative safety of gas and electric lighting in similar emergencies. Though, of course, one has no desire to convert to a trade use any of the horror of this catastrophe, it is quite legitimate to employ it as a warning to the authorities concerned, and also the railway companies, against relying exclusively on the electric light for trains in tunnels. The additional terrors of sudden darkness, from the simultaneous extinction of all the lights on the trains or in the tunnel itself, can very easily be spared. Nor does this remark apply to underground railways alone. On the contrary, there are many darksome interiors wherein, by insensible degrees, the only available lights have come to be electric. In the case of the theatres and music halls, it is true, a few sparse and dejected-looking emergency gas-lights are supposed to be left to show the way out; but it may be questioned if this provision is either adequate or invariably preserved.

There is, of course, a steady influence which militates against the reliability of any fitting which is not regularly and fully used. There ought to be a strict rule, as to emergency or safety gas-lights, that these should not be inconsiderable extras, but should form an essential part of the ordinary lighting arrangements. Only under this condition could one feel assured that the safety light would always be available when wanted. The rule that applies to theatres should also be enforced with regard to churches, meeting-halls, and wherever artificial light is necessary to the security of considerable bodies of people. As regards underground railways, there is a very obvious difficulty in insisting upon a duplex system of lighting the trains themselves; and where the means of traction is electric, the coaches will be lit in the same way. The structure of the line, however, the tunnels, and the exits, should certainly be provided with safety gas-lights, which could be very easily effected. The Board of Trade may adopt measures to ensure this precaution being taken in the public interest; but the railway companies themselves will be well advised to lose no time in reassuring those for whose patronage they are competing with other carriers, that so perfectly obvious a safeguard will not be wanting. The margin of profit on which these costly undertakings are run would soon disappear if the travelling public once lost confidence in the system of working; and the sharp fall that has occurred in the "tube" stocks will remind the various directorates that their tenure of popularity is purely conditional.

The Law of the Colliers' "Stop Day."

A REMARKABLE instance of the difficulty which stands in the way of the ordinary citizen who would fain act up to the requirement that every man should know the law of the land, is furnished by the record of the now famous miners' "stop day" case, just dealt with by the Appeal Court. This latest of the great Trade Union cases which have so fundamentally affected the *status* of these important organizations, has also proved the most puzzling to the Courts, as well as to those who have business relations with the Societies. It was settled at last by a majority of the Court—Lord Justice Vaughan Williams, however, dissenting. The action was brought by the Glamorgan Coal Company and 73 other plaintiffs—colliery proprietors, employing some 100,000 men—against the South Wales Miners' Federation and its chief officials, claiming damages and an injunction, for conspiracy to induce the colliers to break their contracts of service. The defence set up was a denial of the material allegations, and a plea of justification.

The case was heard by Mr. Justice Bigham, to whom were left all the questions of law and of fact. In his considered judgment, his Lordship referred to the South Wales sliding-scale agreement relating to the market price of coal and the rate of wages payable in the local trade. This arrangement gave the men, as well as their employers, an interest in keeping up the price of coal against their natural enemies, the middlemen, whose interest is the exact opposite. In the autumn of 1900, the Council of the Federation apprehended some danger from these foes, who were fully believed to be bent upon bringing about a reduction in the price of coal. In view of this anticipated danger, the Council of the Federation instructed their members to take a day's holiday, which duly occurred on the 9th of November, without the masters being consulted in the matter. A few days later, a conference of miners' delegates was held, at which a resolution was passed authorizing the Council of the Federation to declare a holiday whenever they might think it necessary for the protection of wages and of the industry generally. The employers were annoyed at this action, and a joint meeting of masters and men was held for the purpose of demanding and receiving explanations. The workmen's representatives assured the employers on this occasion that their action had not been directed against them, but was to show middlemen that they were not to be allowed to have their own way in the future. The masters accepted the explanation; but they placed a minute on the records of the Joint Sliding-Scale Committee, in which they clearly expressed their opinion that the principle involved in the stop-day policy was unsound, that the act was illegal, and that it would possibly do the trade more harm than good.

So far, all was well; and if matters had remained as they were, no harm would have resulted. A year later, however, there were stop days again. In the meantime, the judgment in the Taff Vale case had been delivered, and a fresh sense of responsibility towards employers had been instilled in the minds of Trade Union managers. Consequently, the utterances of the Federation officials prior to these stoppages had been mostly of the "don't nail his ears "to the pump" order. A formal resolution that the Council of the Federation should take no responsibility for ordering stop days was placed upon the minutes; but immediately thereupon a section of the men's representatives took it on themselves to order these days, and employed the funds and organization of the Federation to circulate the mandate. The result was that the men stopped for four days, and the

Federation artlessly denied that this was by official order. Thereupon—not in anger, but from a sense of duty—the employers took action to obtain redress and prevent similar proceedings in the future. The Judge found all this to be fact; and he then had to decide upon the law of the matter. He was impressed by the consideration that the advice of the Federation—for he brushed entirely aside the subterfuge of irresponsibility—was not malicious, but was conceived in the honest intention of benefiting the men and the trade generally. Whether or not the advice so given was wise, was not the question. In the end, his Lordship thought that there had not been any conspiracy, inasmuch as there was no malice; and accordingly he pronounced for the defendants. And Lord Justice Vaughan Williams was of the same mind. He was careful to point out that this decision as to the conspiracy part of the action did not touch the individual liability of the men who had broken their contracts. For this they are individually responsible, and might be sued. It was only as to the liability of the Federation for their advice to these men that the absence of malicious intention has been held by both Judges to destroy the presumption of conspiracy.

Lords Justices Romer and Stirling were of a different opinion. They recognized the difficulty of defining what may be sufficient justification for such an act as that of which the defendants were found to be responsible—namely, the procuring of another person to violate his contractual obligations. Where such an act is committed, and justification is pleaded, it is for the tribunal to judge as to the merits of the plea. When a defendant is sued for knowingly procuring the breach of a contract of service, it is not sufficient justification that there is no personal *animus*, or that the breaking of the contract made would be advantageous to both the parties. This judgment is of enormous importance to every master and servant. Whether the Federation in this instance meant it or not, as a matter of fact they did not injure the plaintiffs. This was held to be sufficient ground for the success of the appeal, which was allowed accordingly; but probably the case will go to the House of Lords. Meanwhile, the clear statement of Lord Justice Romer in regard to the law of master and servant, and interfering third parties, is calculated to do great good wherever it applies. It is possible that some may think it difficult to reconcile this judgment with that in *Allen v. Flood*, where the third party was not held to be liable for injury done by men whom he had caused to leave their employment. But in this case the difference is that there was no contract broken, which also goes to show the necessity for these contracts in certain circumstances. It is interesting to note that immediately after disposing of the Glamorganshire case, the Court of Appeal had to deal with another action in which the National Amalgamated Labourers' Union had interfered to prevent a man who was obnoxious to them from earning his living. Their Lordships ordered the Union to pay their victim £100 damages, and to cease interfering with him.

Between Two Lights.

There seems to be a danger, if great care is not exercised in placing full and adequate information before the Reading Town Council on the subject of the relative merits and cost of electric and incandescent lighting, that a majority of the members will fall victims to the craze that prevailed a few years ago (and has since brought about much heart-burning) for electric lighting for street purposes. We undertake to say that many authorities who have electric lighting in their streets to-day, and have had to face the consequent heavy weight of increased rates, would have been glad indeed if their present knowledge was that of the time when they set out upon the unknown "improvement." But those times are of the past; and it is only occasionally now that for street lighting purposes we find local authorities failing to profit from their own or other people's experience. Where electricity for street illumination is spreading is mostly in places where the governing body have an electric light undertaking to support, and the street lighting comes in handily in assisting to make the concern "productive" at the compulsory expense of the ratepayers generally. There will be no excuse for the Reading people if they fail to make a close and real inquiry into the experiences of other towns before they themselves embark on any new scheme of public lighting—whether the illuminant be electricity or gas. We say this with every confidence, because if common sense is allowed to lead, then there can only be one result to such an inquiry. The contract with the Gas Company is shortly due to expire; and the end of the contract will be the end of a system of public lighting that is nothing short of a disgrace to any municipality who claim to be, in the best sense of the word, progressive. A Committee of the Council have made certain recommendations for the adoption of a combined system of street lighting, in which incandescent gas lighting takes a prominent part, and electricity is proposed for portions of the tramway route. This combination scheme, it is estimated, would involve an addition to the present annual cost for public lighting of £2840, which is equal to a 2d. rate. The recommendations have been before the Council. But it is manifest that there is a considerable amount of bias in favour of electric lighting among the members; and through that the proposals have been referred to a Committee of the whole Council. Meanwhile, the Gas and Electric Lighting Companies are to be asked to submit complete schemes for the lighting of the borough.

Cost and Experience.

Now, the cost and the comparative candle powers of incandescent gas lights and electric lights are the points upon which some of the councillors are unsettled in opinion, while others have, it seems, been primed to such an extent by the electricians that they fancy they have really got to the root of the whole matter. "Light for light," they say, using the well-worn, expression, "electricity is cheaper than gas." The Reading councillors may not know it, but this statement, complete as it stands, is as old as the first Electric Lighting Act. How often it has done duty, it is hard to say. Many an authority has fallen under the argument; and is Reading going to afford another example of its seductive influence, and later further proof of its fallacy? If electric lighting were so much cheaper than gas, light for light, do the Reading Town Councillors think the Borough Councils of London and numerous other authorities the country through would be going in so strongly for incandescent gas lighting as they are now doing? Many of them have had opportunities of learning the lesson that the Reading Town Council, or some of the members, have yet to learn, and that is that the streets of a town can be *efficiently* lighted considerably cheaper by incandescent gas-lights than by electricity. One member of the Reading Town Council the other day called the attention of his colleagues to the reports that Mr. J. W. Bradley, of Westminster, has made on the subject of public lighting. Now, the most interesting table in these reports is that which gives the actual cost per mile of street of lighting by different systems in the City of Westminster. It shows that the greater the amount of incandescent gas lighting in a district, the lower the cost per mile; the greater the quantity of electric lighting, the higher the cost per mile. If the scheme as proposed by the Borough Surveyor of Reading is adopted, the additional cost will be equal to a 2d. rate. That surely is a sufficient increase. If electric lighting is adopted throughout the borough, or more freely than is proposed, the Town Council may depend upon it (and they will get proof, by studying Mr. Bradley's table) that the lighting rate will grow, with a certainty, as the electric lighting is extended.

Fantastical Candle Power.

When one of the councillors of Reading states that "light for light, electric lighting would be about half the cost of gas," we tell him frankly, and without hesitation, that the mere statement shows he does not know what he is talking about. We should like to hear his definition of a 1000-candle power electric light. People who know nothing about photometrical questions had much better arrange, before they publish their ignorance, to judge of these things from actual demonstration, and trust to their eyes by comparison, to determine whether things are as represented—in other words, whether a 1000-candle power electric light is the same thing as a 1000-candle power incandescent gas-light. We guarantee that if the Corporation asked the Gas Company to erect an incandescent gas-lamp of 1000-candle power and the Electric Lighting Company one of their so-called 1000-candle power arcs, it would not be the former that would be voted by the majority of the councillors as the second-best lighting medium. The 1000-candle power incandescent gas-lamp would represent to

their eyes something more than the "nominal" 1000-candle power arc lamp. This reminds us that the councillors must not run away with the idea that 300 candles is the climax of illuminating power in incandescent gas lighting from a single lantern. The Gas Company can work to order in this respect, and can give them any candle power they can reasonably require from a single point. But the questions of expediency and efficiency come in. What is wanted are well-lighted streets; and a few centres of large lighting power in the streets of an ordinary town are not the best means of getting light well diffused. Let the councillors, too, bear this in mind, that all light provided in any one spot in excess of the requirements is waste, and that waste has to be paid for. One of the local papers, in an editorial, remarks: "We strongly urge the Corporation to adopt a system of electric lighting." It would be a delightful thing to have the writer's reasons. He must be in possession of many unanswerable ones, seeing that he not only urges, but "strongly urges," the Corporation to adopt the electric light. It will be a matter of keen disappointment if it turns out that the words were penned without due consideration.

Another Mosely Commission.

Mr. Mosely, whose recent Labour Commission to America has already been noticed in the "JOURNAL," is now actively engaged in making arrangements to conduct an Education Commission round the Universities and schools of the United States and Canada. The delegates, to the number of about thirty (whose names, however, have not yet been published), will leave England early in October. Every possible branch of education will have its delegate, who will have the fullest opportunities of seeing how his particular work is performed on the other side of the Atlantic. Each delegate will be required to write his own report; and the collected reports will be published next spring in one volume. Mr. Mosely is said to anticipate the achievement of great results through the presence on the Commission of representatives of the County Councils of England, Scotland, Ireland, and Wales, who have in most cases received special mandates from the Councils with regard to their reports. The question of technical education is of such paramount importance, that any addition to existing knowledge on the subject this side will be heartily welcomed. At any rate, it will not be Mr. Mosely's fault if no benefit accrues to us from the work of his latest Commission.

Mutual Workmen's Compensation Schemes

From the report of the Chief Registrar of Friendly Societies which has lately been issued, we learn that during the year ending Dec. 31, 1902, only two certificates were granted in respect of mutual schemes under the Workmen's Compensation Acts, 1897 and 1900, while in one other instance the certificate was revoked. The first certificate was with regard to the Crystal Palace Gas Company's accident fund, the application in connection with which was supported by 540 out of 544 workmen. The scheme provides for a pension during life or widowhood of not less than 10s. per week on the death of a workman leaving dependants; £12 from the burial fund on the death of a workman leaving no dependants; 12s. a week for the first two weeks, and 18s. a week afterwards during incapacity. The contribution made by the Company is 1s. a quarter per man on the maximum number of men employed in any one week in the quarter; while the amount contributed by the men is 2d. each per month. The scheme is guaranteed by the Company. It is stated that objection was made by two workmen that the widows' pension was not an equivalent to the compensation under the Act; but this contention did not appear well founded, and was subsequently withdrawn. The second scheme was promoted by the Mountsorrel Granite Company, and is stated to be far more favourable to the general body of workmen than the provisions of the Act. The compensation is £23 10s., including funeral allowance, and a pension of 5s. a week to the widow during widowhood, and 2s. 6d. per week to each child under 13 years, with discretionary allowances for parents or other relatives, on the death of a workman leaving relatives; £31 if a man, and £18 if a boy, on death leaving no dependants; 10s. per week for men and 5s. a week for boys from the time of accident, with medical attendance free, payment to continue for six months (unless work is resumed sooner) in case of disablement. Longer disablement is compensated by the employers, who also provide a hospital, and contribute two and one-third times the total sum collected from workmen and boys by entrance fees and subscriptions. The contribution of the men is 1s. entrance fee, and 6d. per month; of the boys, 6d. entrance fee, and 3d. per month. We have on previous occasions when noticing the Registrar's report expressed regret that the number of these mutual schemes does not increase more rapidly. The two instances given above—one of them, too, relating to a progressive Gas Company—show how favourable to the men such an arrangement can be made; and it would be a good thing if more gas undertakings could see their way to follow the lead of the South Metropolitan and Crystal Palace Gas Companies in this respect. The workmen would gain, and so also would the employers—in more ways than one.

In Operation.

The returns for the year ending June 30, 1902, regarding the schemes in operation at that date give a clear indication of the benefit they confer on workmen. Twenty-seven of these returns embrace information from which a comparison may be drawn between the amount actually paid under these schemes during incapacity and the maximum sum that would have been payable under the Act, assuming all the cases of incapacity to have been such as would have entitled the workman to claim under the Act. From these particulars, it appears that the actual payments under the schemes exceeded by 70 per cent. the maximum payable under the Act. This result is, of course, to a great extent accounted for by the provision the schemes make for the first two weeks of incapacity. Although the Act stipulates that no scheme shall be certified which contains an obligation on the workmen to join it as a condition of their employment, some idea of the popularity of the schemes sanctioned may be gathered from the fact that in 35 out of 47 cases the whole of the men employed joined, while in eight of the remaining twelve cases the proportion was over 90 per cent. In the aggregate, the 47 schemes had, on June 30 last year, been adopted by 127,344 workmen, who during the twelve months contributed £47,184; while the employers subscribed £73,758. The payments on death amounted to £19,153, those during incapacity to £56,234, and other benefits to £9596; and the funds increased during the year by £32,017. From these figures, it seems clear, as the Registrar points out, that the workmen derived from the mutual schemes a full equivalent for the £47,184 they contributed.

Local Authorities and the Lighting of New Roads.

It is so rare to find a local authority testifying to the superiority of gas to the electric light for public thoroughfares, that an instance of such acknowledgment which has lately occurred at Newmarket deserves to be specially mentioned, for more than one reason. Readers of the "JOURNAL" are aware that Mr. J. H. Troughton, the Manager and Secretary of the Newmarket Gas Company, has been for some little time showing the burgesses what the incandescent gas system is capable of doing, whether employed for interior or exterior lighting; and his efforts have been rewarded by witnessing its extensive adoption. But he has the additional gratification of finding that the Urban District Council recognize its advantages, and are unwilling to be burdened with the expense of arc lighting. This attitude they have lately taken up in connection with a private road, called "The Avenue," forming the approach to the new railway station. The road has been made up, drained, and lighted by electricity; and the Council have been approached by the owners in regard to taking it over. This is where the trouble comes in. The Council are not keen on adopting the arc lamps which have been put up, when they can light the road at less cost—and we venture to suggest more efficiently—by means of gas. They are quite ready to take over the road, but they ask to be paid the extra expense entailed by the use of the lamps installed, in comparison with those which the Gas Company would have put up. This request appears to us to be perfectly reasonable. When the subject was before the Council a few days ago, one of the members seemed to think they should take over the road, and then make any change they please in connection with the lighting. They declined to adopt such a course—and very

judiciously. The road could be effectively lighted in a certain way for a reasonable figure. If the owners wish to have a more expensive system, it seems to be only just that they should pay the difference in cost. The action of the Council should serve as a warning to makers of new roads to adopt the cheapest method of lighting them, if they wish to ensure their being taken over with promptitude by the local authority. At all events, they might well ascertain the views of the latter on the subject, before actually installing any system.

Combustion Products of Gas and Oil Stoves.

The work of the Government Laboratory is not known to many of our readers, except through occasional references to the reports which the Chief Chemist (Dr. T. E. Thorpe) furnishes month by month to the Registrar-General on his examinations of London water. The account which he has lately presented to Parliament of the work carried on in the Laboratory during the twelve months ending the 31st of March shows that it is of an extremely varied and most useful character; and in the present case it included some investigations which concern a different class of readers from those engaged in the supply of water. At the request of the Home Office, experiments were conducted to ascertain the character of the products of combustion in gas and oil stoves. It had been stated that stoves are frequently used in workrooms where there is not an open chimney or fireplace in which the stoves can be placed; and it was desired to ascertain whether, along with the main products of complete combustion (carbon dioxide and aqueous vapour), there was an appreciable production of the more actively injurious gases, carbon monoxide and acetylene. Five of the best-known stoves—three burning gas and two oil—were supplied to Dr. Thorpe from the Office of Works; and with these he experimented, with the following results: After the stoves had been alight for some time, it was found that no acetylene was produced, but that a small amount of carbon monoxide was a regular constituent of the products of combustion; the actual quantity produced per hour being 0·0024, 0·0048, and 0·048 cubic foot respectively for the gas-stoves, and 0·023 and 0·032 cubic foot for the oil-stoves. These figures represent the actual production of the stoves; but the consumption of gas and oil was different in each case. If calculated for equal consumption, the relative figures are as follows: Gas stoves, 0·0063, 0·0065, and 0·048 cubic foot; oil-stoves, 0·0417 and 0·032 cubic foot. The first two results quoted for gas-stoves were obtained with stoves of different type; the first being of the argand class, burning with luminous flame, while the second had bunsen burners, the flame from which impinged on skeleton non-combustible fuel. Dr. Thorpe directs special attention to the interesting and important fact that the production of carbon monoxide is "considerably greater in the oil-stoves than in two out of the three gas-stoves"—in fact, it is 82 per cent. more; and he says it "emphasizes the necessity of carrying off the products of combustion from every class of stove," by means of a flue, if possible, or, where this cannot be provided, by "securing that, by good ventilation, there shall be no chance of an accumulation of these gaseous products."

Arbitration and Honorarium.

When is an arbitration completed? Is it when the evidence is all tendered and the speeches of Counsel are finished, or only when the award is issued and taken up? The question has been exciting some interest at Devonport, and has given rise to more feeling than so prosaic an inquiry appears capable of arousing. Some months ago—in the early stages of the arbitation proceedings to determine the price which the Corporation are to pay for the undertaking of the Devonport Water Company—the Corporation were threatened with the loss of the services of Mr. A. B Pilling, their Town Clerk. Mr. Pilling was a candidate for the appointment of Town Clerk of Croydon, at a salary considerably higher than he was receiving at Devonport. While much concerned at the prospect of being deprived of the services of their legal adviser at such a juncture, the Devonport Corporation did not consider it desirable to offer a still greater salary. It was, however, agreed (by formal resolution) that, if Mr. Pilling abandoned his candidature at Croydon, he should be paid £400 by way of honorarium—the payment to be made on the conclusion of the arbitration. Mr. Pilling remained at Devonport; the arbitration took place; and a few weeks ago (having been re-opened at the request of the Company), it was definitely closed so far as the evidence and the proceedings before the Arbitrator were concerned. The award has still to be made; and legal proceedings are likely to ensue to determine certain points which are held to be outside the scope of the arbitration, though they have an important bearing upon the ultimate question of the value of the undertaking. In the meantime, Mr. Pilling left Devonport for the more remunerative position of Clerk to the London Water Board, and suggested to the Corporation that the time had come for the payment of his promised honorarium. The answer was that the arbitration was not concluded, and that the time for paying the £400 would only arrive when the award was made. Mr. Pilling was not content to wait. He probably thought that to admit so much might mean the postponement of payment until the Greek Kalends; for, on the making of the award the Corporation might have argued that the conclusion of the arbitration would come when they took up the award, or when the matter had been argued and decided in the High Court. Accordingly, the Corporation were served last week with notice that, unless they paid forthwith, a writ would be issued for the recovery of the money. The Committees before whom the matter came were unable to agree upon an answer to this demand. On the one hand, the Water Committee said that the money ought to be paid; that it had been earned; and that litigation under such circumstances would be absurd. On the other, the Finance Committee were in favour of a strict interpretation of the meaning of the words "the conclusion of the arbitration." The Town Council on Thursday were called upon to decide between these conflicting views; and, after some discussion, of the unedifying character which is characteristic of such debates, they decided, by the narrow margin of one vote, to pay. This is a very sensible decision, and the majority are to be congratulated upon having arrived at it and avoided litigation of a particularly useless character, though it leaves us still without an authoritative answer to the question, When is an arbitration concluded?

West's Charging Machines at Crefeld: Further Improved Results.—Herr Salzenberg, the Director of the Crefeld Gas-Works, has furnished the average carbonizing results achieved with the installation of West's retort-stoking machinery at the works during the month of July. These results supplement those for the month of June, given on p. 233 of the "JOURNAL" for the 28th of July, and are an even more striking testimony to the excellent work the stoking machinery is performing under Herr Salzenberg's able management. During July, the average weight of coal charged into the retorts, with six-hour charges, was 482·8 lbs. The average make of gas per ton of coal carbonized was 11,541 cubic feet (in June, 1902, when manual stoking prevailed, it was only 10,127 cubic feet—not 10,837 cubic feet as stated on p. 233 of the "JOURNAL"). The average make of gas per retort per 24 hours during July was 9906 cubic feet; whereas in June, 1902, with manual stoking, it was only 8263 cubic feet. It may be added that Herr Joly, the Directer of the Cologne Gas-Works, was Chairman of the meeting of the Association of Gas, Water, and Electrical Engineers of the Rhine Provinces and Westphalia at which Herr Salzenberg's original account of the reconstruction of the Crefeld Gas-Works was presented. In the "JOURNAL" article (*ante* p. 228) Herr Salzenberg was inadvertently referred to as presiding at the meeting at which his paper was read.

Leeds and Butterfield on the Generation and Use of Acetylene.—Ever since the memorable lecture by Professor Lewes at the Society of Arts now nearly nine years ago, a gradually increasing interest has been taken in acetylene; and in order to satisfy the inquiry for a work dealing concisely with its generation and use, Mr. F. H. Leeds, F.I.C., F.C.S., and Mr. W. J. Atkinson Butterfield, M.A., &c., have prepared a practical handbook on its production, purification, and subsequent treatment for the development of light, heat, and power, which has just been published by Messrs. Charles Griffin and Co., Limited. In a prefatory note, the joint authors (one of whom is well known for his "Chemistry of Gas Manufacture") state that their special aim has been to explain the various physical and chemical phenomena accompanying the generation of acetylene from calcium carbide and water, its combustion in luminous or incandescent burners, and its employment neat, compressed into cylinders, diluted, and as an enriching material. A valuable feature of the book is a comparison of acetylene and other illuminants on the basis of "illuminating effect" instead of on that of "illuminating power," which the authors characterize as misleading. A subject on which inquiries have been at times addressed to us—viz., the proper sizes of mains and service-pipes for delivering acetylene at different effective pressures—is dealt with by the authors. The text of the book is amply illustrated.

ESSAYS AND REVIEWS.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 455).

It cannot truly be said that the week just closed on the Stock Exchange was much of an improvement upon its predecessor. Though not altogether devoid of rather more cheerful intervals, it was very sensitive and vacillating; and it did not take much to spoil any little tendency to recovery that might show itself. Bulgarian affairs and the American financial outlook continued the ruling bugbears. The business of the fortnightly settlement was not got through without failures, though none of any magnitude. In the Money Market, there was a brisk demand for Stock Exchange requirements; and rates stiffened accordingly, though they eased off at the close. Discount remained very firm throughout, and rather looked like getting tighter. In the Gas Market, business was pretty brisk on the first few days of the week; but then it fell away to very small proportions. However, the tendency showed a marked improvement, and several issues made a good advance. The variations consequent on many quotations *ex div.* also come out advantageously. It really looks as if the market was beginning to realize that high-class gas stocks have too long been left figuring at inadequate quotations; and the Companies' accounts which have come to hand during the week show some very good results of the past half-year's working. Of Gaslight and Coke issues, the ordinary was in high feather, opening well and advancing daily until it changed hands more than once at 90—a price which it had not commanded for a long while. It touched 88 *ex div.*, which is a fraction better still. The secured issues were little noticed; and it is not a good time for gilt-edged securities in general. South Metropolitan was only moderately dealt in; and the last prices were not the best of the week. Commercial had a fair advance in view of the satisfactory position shown by the half-year's accounts and the improved dividend. In the Suburban and Provincial group, transactions were very small; and changes in quotation (apart from *ex div.* variations) in the London Market were confined to a slight advance in Tottenham "B," though the large increase in the Company's business last half year would seem to warrant something more. In the local Exchange, Liverpool advanced a couple of points. In the Continental Companies, business was quiet, and prices only about held their own. There was nothing to note in connection with the remoter undertakings. Business in the Water Companies showed no increase of vitality, and the tendency still appeared to be generally towards easier prices. Apart from *ex div.* variations, Lambeth 10 per cent. and Southwark ordinary lost 5 points each.

The daily operations were fairly brisk on Monday and Tuesday in Gas. Gaslight ordinary rose 1 each day. Thenceforward everthing was quiet. Other changes were: Tottenham "B" rose 1 on Tuesday, Gaslight ordinary rose 1 on Wednesday, and on Friday Commercial 4 per cent. rose 3, and ditto 3½ per cent. 4.

ELECTRIC LIGHTING MEMORANDA.

The Fire on the Paris Underground Railway—The Probable Cause—The Lessons of the Catastrophe.

There is but one topic for the moment in connection with things electrical, and that is the awful electric fire on the Paris underground railway, which caused the death of about a hundred persons, mostly poor working people. News of such a calamity is at first stupefying, and it takes one some little time to realize what has happened. Of course, it has been extremely difficult to disentangle the pertinent from the mistaken and the unnecessary explanations of the accident published in the newspapers; but the essential facts are few and simple enough, as they always are in great tragedy. A train became immovable by its own motors, owing to some mishap not necessarily serious in itself; and the brilliant idea occurred to somebody to push it along by the following train. The result was to overload the motors of the second train, with the consequence that these machines were broken down and burnt up with the inevitable short-circuiting, which is capable of unimaginable mischief. All the material which could come into contact with the flames was highly inflammable; and burning pitch, gutta-percha, india-rubber, varnish, and woodwork soon filled the tunnel with an atmosphere in which no human being could live. This seems to have been the way of it. Of course, all sorts of questions might be asked respecting the why and the wherefore of this simple sequence of events. The discipline of the service was deplorable, as nobody appears to have been in a position to issue effective orders. All this triumph of French engineering seems to have been left to the chances of the stupidity of a driver and a station-master, who contradict one another as to what happened before the fire. There was no engineer present or within summoning distance. Nobody knew how to cut off the current. It is said that four trains altogether were allowed to pile themselves against each other in the blazing tunnel. Indeed, the line appears to have been left to take care of itself.

Apart from the momentary abandonment of the property by everybody who might be supposed to have a head on his shoulders, and not to be absolutely ignorant of the electrical arrangements, there is reason to think that the motors in use were too weak. It is not, after all, an irrational supposition, that in an emergency one electrical train might be required to push or drag another which had become helpless. The operation can be witnessed in the streets of London any day when one of the tramcars of the London County Council happens to stick fast on the line near a terminus. Usually, we believe, an electric train or tramcar is fitted with independent sets of motors, each of which is capable of exerting more than double the power necessary to drive the vehicle in ordinary circumstances. There is not very much risk of overloading one of these motors, carrying a pair of 40-horse power machines, while the working traction is from 15 to 17 horse power. We are now speaking of tram-cars; but the same surplusage of motor power is always understood to be necessary in the case of all electric machines. This is, indeed, one of the drawbacks to the extended employment of electric machinery on board ship, and for many other uses. It is necessary to have a large excess of motor capacity, lest at any time something should jam and throw an overload on the machine, which would instantly burn across. Besides the heavy cost of this excess motor capacity, there is a danger of burning-out the armature when overloaded. Of course, with a steam, hydraulic, or gas-engine, if there should be an overload nothing worse happens than the coming of the machine to a standstill, of which there is plenty of warning. It is different with electric motors.

It is remarked elsewhere that this disastrous experience of the Paris underground railway, should serve as a warning of the danger of depending upon the traction system for the safety lighting of the line and stations. An inkling of this has already struck the Parisian authorities; and there is some talk of their extending to the electric railways the same requirement which, it appears, is enforced in the case of the Paris theatres—that the lighting should be divided between two different and independent sources of supply. This would be something; but the imperative employment of gas for safety lights would be infinitely better. It is necessary to remember that, in the case of distributed electricity, with strong currents all the essentials of a serious fire and explosion are present together. The same cause that melts and gasifies the insulating material also contributes the spark to set it alight. Indeed, the one effect is never present without the other in touch with it. And the Paris example also proves once more that nothing less inflammable than metal will resist the power of ignition of a short-circuit. The trains were supposed to be built of wood treated to make it uninflammable; but they burnt to the iron framework just the same.

The whole affair is replete with lessons and warnings of the greatest possible import for all who have anything to do with strong currents of electricity for any purpose. Whether or not all the facts come out in the course of inquiry, the same observation applies. It looks as though this new servant of mankind is not yet perfectly broken in to its proper work, or else that those who have essayed to harness it have presumed sometimes upon their partial knowledge of its properties. There is something still to be said for the view that man has gone rather too fast with his applications of a force of whose nature he is profoundly ignorant. This has been done by stages, of course; and there has been no warning that any particular step forward was more hazardous than those which led up to it. But such results as the accident in question are not reassuring, to put it as mildly as possible.

SHOULD GAS COMPANIES AND CORPORATIONS VEND "PRODUCER" GAS.

[Second Article.]

So much for the fallacy that a residual product can ever pay for the raw material of the chief manufacture. Next, as regards the market for the chief product itself, and the price at which it can be sold, if at all. This problem is presented to the Mond gas speculators very much as it is to their congeners who have elected to try their luck with electricity-in-bulk generation and sale. That is to say, they must not depend upon the small consumer, in his thousands, with his diversified wants; but they stand or fall by what they can make by the large power or fuel user. He is a wary bird. He wants all his own way in every bargain, and prefers to fix his own price for everything he is open to buy. There is no evidence that, after fifty years' experience, the British iron manufacturer, brick burner, and millowner of sorts does not know as much about fuel gas as a company can teach him.

Hitherto, every distribution of fuel, or of power, has been for the mutual advantage of the small user and of the supplying concern. The scale of charges has been high, at per unit; and the user has paid them because his wants were small, because it was more convenient to him to get what he wanted in this shape than to supply himself—even supposing him to be in a position to do so, and because he saved money by it. In short,

the relationship between the small power or fuel user and the suppliers of the service, is firmly based upon the bed-rock of mutual profit—one cannot do without the other. When one has to do with "bulk" users of a distributed service of fuel or power, the conditions are changed, although the foundation remains the same. The larger any particular demand, the narrower the margin becomes between the price the purchaser can afford to pay, and the cost of supplying him. The mutual dependence disappears. The familiar case of a millowner and a small gas company is an illustration of this general rule. The millowner considers the price he is asked to pay for gas to light his mill with relation to what it would cost him to run his own gas-works, with the result that his custom is hardly worth having, from the point of view of the gas company. It is he who fixes the price, not the company. A dozen or a score like him are no better than one, so long as the proportion of the mill consumption to the rest remains the same. On the whole, it is better for the mill to supply the village with gas, than for the village works to serve the mill as an ordinary consumer in the legal sense.

The case of the "bulk" consumer of gas or electricity is thus wholly different, in regard to a supply company, from that of the small consumer who is yet, as he has ever been, the main support of such undertakings. The difference proceeds from the fact that the bulk consumer can supply himself, while the small consumer cannot. Whatsoever the small consumer wants in this way, therefore, he is bound to buy, or go without. The bulk consumer not only can supply his own needs, but he usually does, or has done so. He knows precisely what the supply he requires is worth to provide; and if he elects to purchase it delivered instead of making it himself, it must be for the sake of some patent advantage to himself. Recognizing this controlling condition, it is extremely difficult for a supply undertaking to do business with a large consumer. Directly his wants attain the proportions of a true "bulk" supply, he finds he can manufacture for himself cheaper than he can buy. Usually, indeed, he underrates the cost of any ancillary service of his own doing, because he leaves out of the account the "on cost" charges which all self-supporting businesses have to bear. So well is this understood, that there are in some manufacturing districts electricity supply undertakings, intended to serve the general public, which will not have any large consumers on their books.

The case for the electricity-in-bulk generating companies which are parcelling out the country among them, is that they may possibly be able to supply scattered electric lighting undertakings of the parochial order at a lower cost than they can generate current locally; and especially that they may be able to pick up a profitable traction business. There is a reason for this hope, which it is to be greatly desired may be realized, for the sake of many deluded local authorities. The linking-up of neighbouring towns by electric tramways, which is so desirable nowadays, can hardly be done at all in many districts unless the power is provided by a "bulk" generating concern. As regards the supply of large manufactories with electric power, however, it looks at close quarters as though the "bulk" undertakers have as little chance of making money in this way as the smallest municipal establishment. It was given in evidence lately, in connection with the Somersetshire Electric Power Bill, that, unless large manufacturers could buy electricity at about ½d. per unit, it would be no use to them. This statement was probably well founded on individual experience.

The question of the possibility of finding a market for producer gas, distributed, must be considered in the same light. Notwithstanding all the generalities put into circulation with the object of showing that fuel and power gas is the one thing needful to British industry, engineers do not require to be told that gas-furnaces and gas-engines are not suited to every purpose for which heat or mechanical power is applied. For some purposes fuel in the form of producer gas is advantageous; and in the same sense the gas-engine worked by so-called power gas is a good servant. British manufacturers, however, are not such absolute fools to their own interest as not to know all this. One thing they certainly do know—that the cost of working a producer-gas plant, like any other heat-yielder, is a matter of the coal bill and labour charges. No industrial user of producer gas measures it in the gaseous form. He does not charge himself with it by the 1000 cubic feet, but merely as coal and wages. This fact makes nonsense of Mond gas estimates at "2d. per 1000 cubic feet," of which so much was heard in the Westminster Committee-Rooms recently. Canvass a manufacturer for an order to lay on fuel or power gas at so much per 1000 cubic feet; and he will ask how much this would save on his coal bill and wages-sheet. The economics of the trade will look very different from these two points of view.

What is the proper way to value fuel gas? By its equivalent fuel value. There is no other known standard that possesses the smallest commercial relevancy; and it would be mere foolishness on the part of any company proposing to go into such a business, to make their comparison of value to the purchaser upon fancy figures of the efficiency of their commodity, and equally imaginary data of the inefficiency of coal-fired furnaces and steam power plants. This sort of thing is the padding of many a paper read before an engineering society; but it does not "pan out" into profits paid into the bank. It is the easiest thing in the world to show that a horse-power of energy has been obtained under test conditions, at full power, for a measured consumption of a certain small quantity of producer gas in a particular gas-engine. It is equally easy to show that the average consumption of coal by the year in a steam power station is perhaps 16 lbs. per horse power actually utilized. Such comparisons do not impress power users. All these paper contrasts are wasted ingenuity. The power user will merely say: "Here is my last year's coal bill; how much will you guarantee to save upon the figure?" To shirk the query, and try to turn the subject to an offer of fuel gas at so much per 1000 feet, would be a sure way to terminate the interview.

Any fuel user already established in business would require to be assured in his own mind, before turning to gaseous firing or gas power, that it would directly pay him to do so. Having satisfied himself on this point, he would next consider what alterations of plant would be necessitated by the change, and how his works staff would stand affected. Generally speaking, gas-firing appliances on the large scale are of expensive construction, and require careful treatment, which is one reason why they have not made more headway in many industries. Take the case of iron puddling as a striking example. An ordinary puddling furnace can be built for about £70; and the puddler stokes it himself. The flues are led to a boiler. When trade is slack, or a football match is toward, the whole affair can be laid off without much loss and without danger. A gas puddling-furnace costs as many hundreds as the other costs tens of pounds, and will not bear being trifled with. Unless constantly worked at full power, it eats its head off; and all for what, in the end? To save (mostly on paper) a small proportion of coal, which is certainly dear at the price. Illustrations could easily be multiplied in the same sense. Where gaseous firing is deemed advantageous, there remains the question of whether to make the gas or buy it. Here the governing factor which determines the answer is still the amount of the coal bill. Nobody has the smallest care for the pricing of producer gas by the 1000 cubic feet, which is an illusory style of treating the proposed business not in the smallest degree likely to secure the booking of a single "bulk" consumer. The ordinary gas interest might justly complain of this trick of pretending to offer "gas" at the fancy figure of 2d. per 1000 cubic feet, because the comparison is naturally and inevitably suggested between such "gas," which is little better than smoke, with real gas-of-all-work unadulterated, purified, and held at the disposal of all legitimate demands without question of quantity.

It comes to this: That whosoever thinks of undertaking to make and vend producer gas in bulk, must be prepared to sell it at about its fuel value. This datum is not for him to determine; but for the prospective customer to agree to. Whether a paying business can anywhere be established on this footing, is not a matter to be disposed of on general principles. There may be districts wherein large manufacturers, recognizing the utility of producer gas, and not wishing to make it for themselves, would find it to their advantage to agree with somebody to supply it on mutual terms. This is what remains to be ascertained. We should not be prepared to say off-hand which of many producer gas processes would prove the best for use in any particular application of this order. For economical reasons, as already stated, it would be fallacious to pay the chief attention to any incidental or residual result of producer-gas manufacture, to the relegation of the main object, which is the gas making, into a secondary place. Any possible economy in manufacture is, of course, worth consideration to the extent of its value; but unless it is wholly within the control of the gas manufacturer, and does not tie his hands in any way, it is to be entertained only with the greatest caution.

A Vitrified Clay Water-Main, 24 inches in diameter and 9½ miles long, is being laid for the new supply to be brought into Findlay (Ohio). Two short river crossings, with a total length of 500 feet, will be of cast iron. The trench ranges from 5½ to 16 feet, averaging 8½ feet. The pipe is in 3 feet lengths.

Tarring Roads in France.—According to a Dalziel telegram sent from Paris on Wednesday, practical steps to combat the dust nuisance are already being taken as a result of the recent successful demonstration of the use of tar as a preventive. The road from Paris to Versailles is now in the hands of the tar-spreaders; while the "Auto" announces the early execution of similar work on the road from Paris to Havre, as the first long-distance experiment.

A Large Gate-Valve.—A 72-inch gate-valve, probably one of the largest ever used for water-works purposes, has recently been furnished by the Ludlow Valve Manufacturing Company, of Troy (N.Y.), for the Chicago Water-Works. This has been installed in the new gate-shaft at the Chicago Avenue pumping-station, an illustrated description of which has just been given in the "Engineering Record." It has a clear opening of 72 inches, and is of the double-gate type, with special bronze rings and valve-seats, and bronze-faced wedges for closing the gates. On account of the great weight of the gate wedges or discs, two solid bronze stems 3¾ inches in diameter are provided, which are operated by spur gears from a 3-inch steel shaft extending up to a standard located near the surface. To open or close the valve, 368 turns of the stem are required. An idea of its size can be gained from its weight, which is 35,000 lbs., or close upon 16 tons. Its height is 18 feet, and its greatest width 10 ft. 6 in. As the valve will at times be subjected to a pressure due to a hydrostatic head of nearly 90 feet, it was built to stand a water test of 60 lbs.

PERSONAL.

Mr. J. W. THOMPSON has been appointed Gas and Water Manager to the Barnoldswick District Council, in succession to Mr. Harry Scott, who has resigned.

As already announced, Mr. J. WILKINSON, the Superintendent of the Grimesthorpe station of the Sheffield United Gas Company, has obtained the appointment of Gas Engineer to the Halifax Corporation, in succession to Mr. Thomas Holgate. On Wednesday evening, he was presented by the officials with a handsome liqueur stand, in testimony of their appreciation of him. Mr. W. Heap, the chief foreman, in asking Mr. Wilkinson to accept the gift, expressed the regret felt by all at losing him, and wished him success in his new undertaking. Mr. Wilkinson, in reply, said he had enjoyed his stay in Sheffield, and fully appreciated the spirit in which the presentation was made. He added that any good which had been accomplished during his connection with the works was not due to himself alone, but to the untiring energies of the foremen and their respective staffs of men.

It is with pleasure we learn that, at the meeting of the Directors of the Crystal Palace Gas Company last Friday afternoon, Mr. J. WESLEY WHIMSTER, son of Mr. James Whimster, of Armagh, was appointed Assistant to Mr. S. Y. Shoubridge, in succession to Mr. Robert English.* Mr. Whimster was educated at the Royal School, Armagh, and commenced his professional training with Messrs. Ashmore, Benson, Pease, and Co., at Stockton-on-Tees. During his apprenticeship (which began in May, 1896), he had experience both in the workshops and drawing office—gaining a good all-round knowledge of the many and varied types of plant manufactured by the firm. The last few months of his apprenticeship were occupied in superintending outside construction work. His connection with Messrs. Ashmore and Co. ceased on his appointment as Assistant Engineer and Manager at Redhill, at the time Mr. D. H. Helps was in chief command there, and he has remained since with Mr. James Paterson. This has been an exceptionally busy period of renewal and extension at Redhill, and has produced a good experience. In his new appointment, we heartily wish Mr. Whimster full success.

The Directors of the Oriental Gas Company, Limited, have appointed Mr. JAMES CLARKE WATSON (formerly of the Crystal Palace District Gas Company, and for nearly seven years past Assistant-Manager at Calcutta) as their Engineer and Manager, in succession to Mr. D. Coats Niven, who, as recently announced, has resigned. For the position of Assistant Engineer and Manager, Mr. JAMES WATT MACKAY, of the Rochester Gas Company, has been selected; and Mr. W. H. SHIPP (late of the Gloucester, and previously of the Bristol, Gas Company) is going out to take up the duties of Outdoor Superintendent. Mr. Mackay was for about 3½ years Manager of the Rochester works of the Rochester, Chatham, and Strood Gas Company, from which about 300 million cubic feet of the Company's total output of 500 millions are sent out. Previous to taking this position, he was assistant to Mr. F. G. Dexter, of Winchester, and prior to that was for three years under his tuition. He was with the Gas-Meter Company for three years as improver at their London and Oldham works. He holds full technological certificates of the City and Guilds of London Institute (both in the Ordinary and the Honours grade) in "Gas Manufacture," gaining the first prize and the Institute's medal. He was for two years a student in the Mechanical Engineering and Applied Mathematics Department at the Institute's Technical College, Finsbury, and was awarded the certificate of the College for passing the several examinations.

COMMUNICATED ARTICLE.

EXTENSIONS AT THE EVESHAM GAS-WORKS.

Purifiers without Connections.

By R. J. MILBOURNE, Assoc.M.Inst.C.E.

A purifying installation of an interesting character has recently been completed at the Borough of Evesham Gas-Works, Worcestershire. Though the installation cannot be said to be of any great magnitude, it is nevertheless important as marking the improvements which are continually taking place in gas apparatus generally. Twenty years ago, it would have seemed absurd to talk about building purifiers without connections or external valves; in fact, for many years improvements in purifiers have been restricted to various small details—such as joints, or variation in the methods of fastening the covers, lifting apparatus, means for filling and emptying, and such like auxiliaries. Although it is now many years since Mr. Henry Green, of Preston, first introduced the luteless type of purifier on a practical working scale, yet for a long time the hydraulic lute remained. Now, however, things have taken a turn; and, probably owing to a combination of circumstances and attention to details, the hydraulic lute is being superseded, and luteless purifiers have come largely into use. An example of this class of construction is exhibited in the Evesham purifiers now under consideration. The lute, however, in this instance is but a minor consideration; the chief novelty in these purifiers consisting of the fact that there are no connections or external valves in the ordinary sense of the term.

The Evesham purifiers are on what is known as the Milbourne system, which is being adopted in many gas-works of some importance at home and abroad. They have been introduced at Evesham to take the place of four purifiers, each 8 feet square by 4 feet deep, with hydraulic lutes, and worked with an 8-inch dry-faced centre-valve and connections. The purifiers were old, and had begun to exhibit symptoms of exhaustion and debility in the shape of cracked plates and worn-out exteriors. Some commendable ingenuity had been exhibited by the Council's Engineer (Mr. Percy H. Fletcher) in baffling with the ravages of time and subsidence of foundations, by patching up the deficiencies with 9-inch by 2-inch timber planks secured with wrought-iron tie-bolts. These operations, excellent as they were, could not cope with the unfortunate (or, perhaps, fortunate) fact that the work thrown upon these faithful purifiers was becoming greater as their efficiency grew less. It thus became a matter of injustice not to consider the question of pensioning them off—viz., scrapping them—and engaging younger and more energetic purifiers to take their place. This, however, was not such an easy matter to accomplish, as the winter was rapidly approaching, the consumption of gas was increasing, and as the old purifiers were in the same house in which it was necessary to build the new and larger purifiers. The alteration and extensions were thus rendered more complicated.

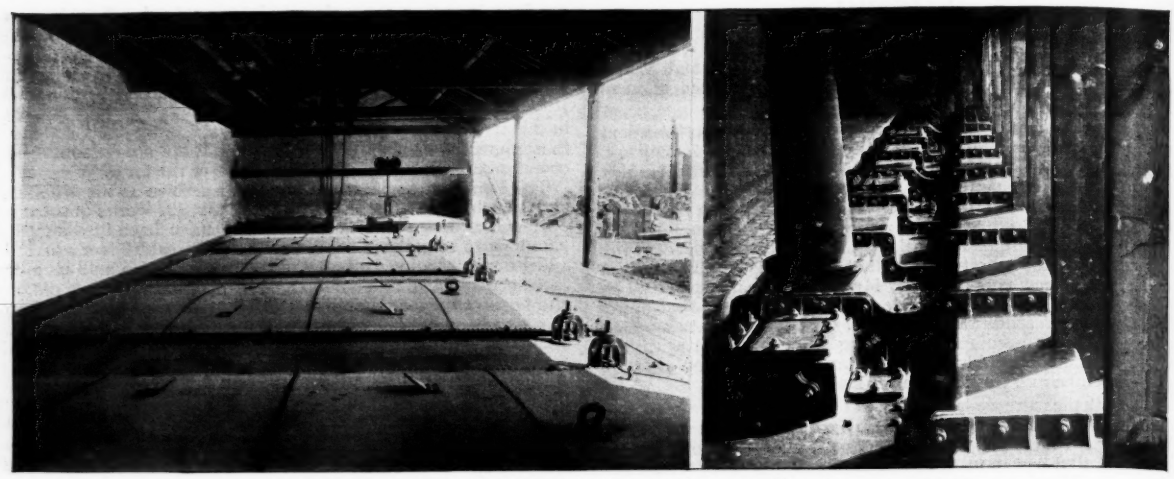
The new set of purifiers are four in number, each 12 feet long by 16 feet wide, and 4 ft. 6 in. deep. They are formed in one box 48 feet long, by 16 feet wide, with three division plates between. Each purifier is fitted internally with two tiers of bearing-bars and wood sieves for working with oxide of iron. The ground space occupied by the new purifiers complete (with valves and connections) is 768 square feet. The old purifiers occupied about the same area; thus giving an increase in purifying capacity of 2048 cubic feet over the old purifiers, with practically the same ground-space.

The new installation is unique, inasmuch as the purifiers are absolutely without any ordinary pipe connections or external valves. This is managed in a very simple and ingenious manner. In ordinary purifiers, the inlet and outlet mains are, of necessity, fixed some little distance away from the side of the boxes; and, with their valves projecting through the floor, they occupy a considerable amount of space. With the Milbourne purifiers, this space is entirely saved by the following means. On one side of the range of boxes, there is cast solid with each side plate a distributing box or chamber, which takes the place of the ordinary inlet main in general use. This distributing box runs nearly the whole length of the set of purifiers, and occupies about the same space as the water-lute on the side plates of the ordinary purifiers. At each purifier there is communication between this chamber and the purifier—consisting of an elbow-pipe with the open end looking upwards into a cast-iron inlet hood, which directs the gas under the lowest tier of sieves supporting the purifying material. The ingress of the gas to any vessel or purifier is controlled by means of a special contrivance fixed inside immediately on the inlet pipe. As this arrangement is of great importance in the Milbourne patent purifiers, it will be necessary to give it a separate description presently.

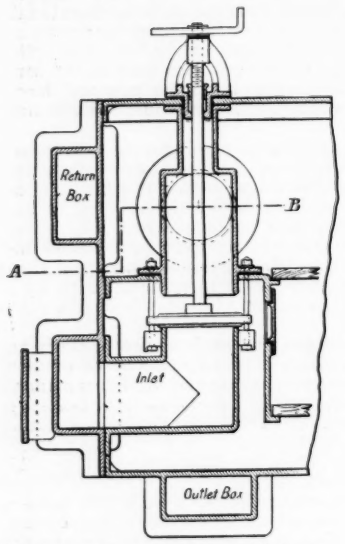
On the bottom plates of the purifiers, a similar chamber or distributing box to that already described is cast solid with the bottom plates, and takes the place of the outlet main usually required in other purifiers. The purifiers communicate with this chamber in the same manner as previously described with the inlet chamber. There is also another chamber, of similar character, cast along the upper side of side plates, but which communicates only with the first and last purifier in the set. This return-box chamber is only required when the purifiers are arranged in line; and it connects the upper outlet of the last purifier with the upper inlet of the first, and acts between them as though they were adjoining.

On each of the division plates of the purifiers, there are fixed two boxes of special design—of elbow-shape—one on each side; and by their means communication is directly obtained between one purifier and the next. The flanges of the boxes are bolted to each other and to the division plate; a passage or opening being formed in the division plate for the gas to pass through from one vessel to another. The lower end of each of these elbow-boxes is circular and looks downwards. It is immediately over a similar open-ended pipe, which communicates with the main inlet or outlet respectively. These constitute the upper and lower inlets and the upper and lower outlets of the purifiers. Through the top of the upper inlet or outlet boxes, a spindle passes, working in a stuffing-box fixed on top of the purifier, and actuated therefrom. The top, at this part, forms a part of the purifier cover, but is immovable. On the lower end of the spindle, a disc is fixed between the two open ends of the upper and lower inlet or outlet pipes. The disc is so constructed that either its upper or lower surface can be brought into contact with

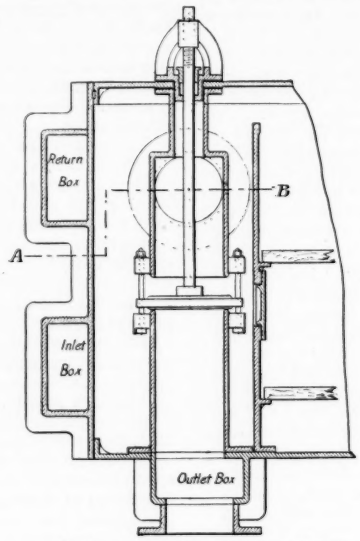
* In referring, on July 21, to the approaching removal of Mr. English to Christchurch, New Zealand, we understand that a mistake was made in describing the position to which he has been appointed in connection with the Gas Company there as that of "Assistant-Engineer." It should have been Engineer and Manager.



DETAILS OF MILBOURNE'S PATENT PURIFIER VALVE.



SECTION THROUGH INLET-PIPE.



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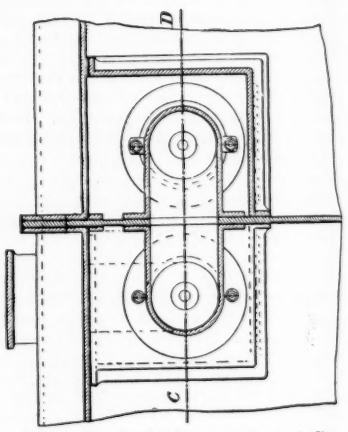
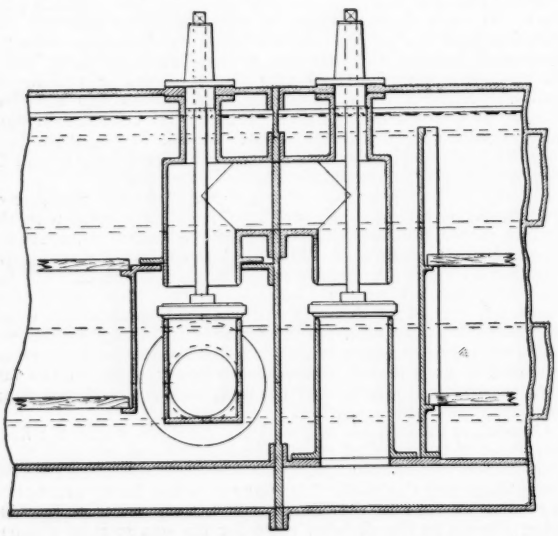


SECTIONAL PLAN THROUGH A B.



SECTIONAL ELEVATION THROUGH C D.

the open end of either the upper or lower pipe, and so shut off either as required. The shutting of one pipe always—at the same time and with one motion—opens the other, and *vice versâ*.

The inlet and outlet connecting-boxes are both practically of the same design, except that the one which acts as the inlet must have a hood cast or fixed on to its lower edge, in order to direct the gas under the lowest tier of sieves, while the box which acts as the outlet is free of this hood. It is however enclosed in a box, the top end of which is open, and projects above the topmost tier of sieves. It thus induces the flow of gas to take place in the proper direction; the lower end of the box being, of course, attached to the bottom of the purifier.

By speaking of upper and lower inlets and outlets, it might be imagined that there were two inlets to each purifier, and two outlets. This however is not the case; both the upper and lower inlets are practically in one, as are the upper and lower outlets, and it is by means of the disc that each becomes two distinct and separate pieces of apparatus.

The inlet chamber previously described communicates directly with the purifier; and to allow of this the lower inlet is opened by means of raising the disc. At the same time, the upper inlet is closed. The gas then is compelled to travel through the purifying material to the outlet box, descending which it either goes direct into the main outlet or into the next purifier, according to whether the outlet disc be raised or lowered.

The lifting apparatus is very simple, consisting of a Herbert Morris and Bastert pulley-block and carriage mounted on a rolled steel joist 8 in. by 5 in. attached to the tie-beams of roof-truss with flat-iron straps. The holding-down bolts or fasteners for the covers are all movable, and can be carried away with the cover when it is raised. There is thus left a perfectly clear top, without any obstruction, for the men when filling or emptying the purifier. The top of the purifiers are fixed level with the ground-line, for convenience in emptying and filling.

It would certainly appear that these purifiers have many features to recommend, and that the changes which can be effected are as numerous as those which are obtained with a most improved modern centre-valve or with a system of twelve slide-valves. It is claimed that the time required to throw a purifier into or out of action is less than one-fourth of that required with the ordinary slide valves. The discs controlling the flow of gas are worked entirely from the top of the purifier—in the most convenient positions—and show at a glance how the purifiers are being worked, without the assistance of diagrams. The spindle itself in each case is a visible and unmistakeable indicator as to which valves are open and which closed. The use of the discs is also an advantage over that of ordinary valves, inasmuch as they (the discs) can always be examined by means of the hand-holes, whenever a purifier is thrown out of action for cleaning, without interfering with the working of the remaining purifiers.

TECHNICAL RECORD.

IRISH ASSOCIATION OF GAS MANAGERS.

THE meeting of the Irish Association of Gas Managers at Waterford last Tuesday was not fruitful of anything which was really new or of superlative interest; yet one or two items are well worth more than passing notice. High fare need not be looked for in an Association which contains probably no members whose make of gas runs into nine figures, and not a few whose make does not run into more than seven figures. But plain fare, if well served, is generally more nourishing than is a pudding too full of plums. This simile conveys a very good idea of the place which the meeting will take in the annals of the Association.

Mr. R. Bruce Anderson, of London, whose local connection is one of the things of which the members are proud, contributed a paper full of good matter, in respect that it detailed the working out of problems connected with the gaseous firing of retort-settings, and gave incontestable reasons for the taking of the various steps in the movement. In listening to so well-told a tale, it could not but be felt that the work described was not that of a copyist but of an original thinker. There was the double evidence of this in the unfolding, first, of the scientific theory, and then of its application to existing conditions in the various gas-works. Such a series of clearly stated propositions could not fail to exercise a highly educative influence upon the minds of managers who are striving to overcome difficulties in details when they endeavour to apply first principles in the construction of producers.

The paper upon the same subject by Mr. W. Dunn, of Queenstown, brought to mind the famous chapter upon snakes in Ireland. Professing to be upon "The Progress of Regenerative Settings since 1880," its first sentence contained the statement that "there has been practically no improvement in construction or results obtained for the past twenty-five years." Of course, this view was not accepted, as, indeed, it could not very well have been, seeing that there are so many variations upon regenerative settings, nearly every one of which is claimed to possess some distinctive merit. The assertion was too sweeping, and should only have been made if the author was prepared to produce proof in support of it. He did not do so—indeed, his remarks went to show that there has been considerable activity in the matter of perfecting the process of regenerative gas firing, which was again a contradiction of himself. It is difficult to account for Mr. Dunn's somewhat strangely mixed-up conclusions. This difficulty would not have been experienced if he had confined himself to a description of what he saw at the Paris Gas-Works, and had left out of account anything of which he did not approve. Instead, he threw a boomerang, which ended where it began, so far as regenerative firing is concerned.

The introduction of the subject of gaseous firing gave the opportunity to Mr. R. G. Shadbolt, of Grantham, to impart some information regarding the Settle-Padfield method of carbonizing coal, which was highly acceptable, and which, indeed, added vastly to the value of the meeting. Though Mr. Shadbolt was present only in the capacity of a visitor, his contribution to the proceedings was beyond doubt of more consequence than the oral communications of any of the members, inasmuch as he was in the favoured position of being able to lift a little a veil behind which many are desiring to see.

The other contributions, by Professor Tichborne, of Dublin, and Mr. W. Paterson, of Tipperary, filled in the time of a day which was worthily spent.

The President—Mr. J. G. Tooms, of Waterford—was happy in his remarks, and happily situated in having the generous co-operation of his Directors in the entertainment of the Association. A marked change is noticeable in the composition of the meetings of the Association of late years—in respect that the northern element seems to be decaying and the southern to have taken the command. This feature may be accentuated by the fact that it is now several years since the Association met in the North. From the time the Association extended its area so as to embrace the southern portion of the island, the northern members have shown an extreme generosity to their southern brethren in the matter of the localities to be visited. The distance from many members at which the meetings have been held for the past four years may account for the falling off of attendance from the North—a notion which is to be preferred to that of lack of interest. Next year's meeting is to be held in the North, under the Presidency of the popular Honorary Secretary (Mr. James Whimster, of Armagh). It is to be hoped that, for his sake—if not for the credit of themselves—there will then be a better representation from the Northern Counties

Report of Proceedings.

The Annual Meeting of the above-named Association was held in the Town Hall, Waterford, last Tuesday. There was a good attendance of members. Mr. J. G. TOOMS, the Manager of the Waterford Gas-Works, the President, took the chair, shortly after eleven o'clock.

The PRESIDENT, in opening the business, said he regretted that the Right Worshipful the Mayor, Mr. James A. Power, was unable to be present to give the Association the welcome it was expected that he would do to the ancient city; but he (the President) was authorized, on his behalf and on that of the Corporation and citizens, to extend to them a very cordial welcome, and to express the hope that the meeting would result in both pleasure and profit to all taking part in it.

THE REPORT AND ACCOUNTS.

The HON. SECRETARY (Mr. James Whimster, of Armagh) read the report of the Committee. It stated that they recalled with pleasure the very successful meeting in Cork last year, which was contributed to in no small degree by the hearty reception and generous hospitality of the Directors of the Cork Gas Company. The Committee anticipated, from the great interest shown in the Association's visit to Waterford by the Directors of the Waterford Gas Company, that the meeting this year would be no less successful. The papers to be presented were on subjects in which all gas engineers were deeply interested at the present time, and they should form the bases for instructive discussions. Their good friend Professor Tichborne, although he had lately been laid aside by sickness, had very kindly consented to favour them with another lecture, which was certain to be highly appreciated. The Committee regretted exceedingly having to record the death during the year of one of the original members of the Association, and a Past-President, their esteemed friend Mr. R. Ross, of Dungannon; as also of one of their best-known extraordinary members, whose sudden death through accident caused a shock to the whole gas world, shortly after their last meeting—Mr. E. W. T. Richmond. Another of their original members, and a Past-President, had retired during the year; and the Committee wished to assure Mr. A. Gibb, late of Newry, of the good wishes of his brethren in his well-earned rest. There was still a heavy leakage in their membership, from removals and other causes; but they had fresh applications for admission every year so that the number on the roll kept about the same.

Mr. G. W. NORMAN (Dublin), the Auditor, reported that the income of the Association for the past year, including a balance forward of £49, amounted to £79 9s. 6d. After meeting all the expenditure, there was a balance in hand of £50 14s. 1d.

Mr. F. EUSTACE (Tullamore) proposed that the reports be adopted.

Mr. G. LENNON (Dungarvan) seconded the motion, and it was agreed to.

NEW MEMBERS.

The following were proposed for membership of the Association:—

Ordinary Members.—Brodie, James, Omagh; Enright, J. E., Maryborough; Gibson, B., Newry; Lyons, J. C., Dundalk; Mitchell, B., Bangor (Co. Down); Moorhouse, J. L. Killarney; Watson, T., Midleton (Co. Cork).

Extraordinary Members.—Chisholm, James, Glasgow; M'Crie C. G., Edinburgh.

The HON. SECRETARY moved, and Mr. R. YOUNG (Youghal) seconded, the election of these gentlemen; and the motion was agreed to.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT said that at a meeting of the Committee that morning they had under consideration, among other things, the question of the office-bearers to be elected; and they had provisionally selected certain members for the different offices.

Mr. A. MACKENZIE (Edinburgh) moved that the President read the list prepared by the Committee; and this was agreed to.

The selections were as follows:—

President.—Mr. J. Whimster, of Armagh.
Vice-President.—Mr. G. Airth, of Dundalk.
Members of Committee.—Mr. S. B. Langlands, of Coleraine; Mr. P. Conroy, of Galway; and Mr. G. W. Young, of Tralee.
Hon. Secretary (pro tem.)—Mr. J. G. Tooms, of Waterford.
Auditor.—Mr. G. W. Norman, of Dublin.

Mr. A. MACKENZIE moved that the list be adopted in its entirety, and that the gentlemen proposed should be appointed.

Mr. R. BRUCE ANDERSON (London) seconded the motion, and it was carried unanimously.

INAUGURAL ADDRESS.

The PRESIDENT then delivered his Inaugural Address, as follows:—

Gentlemen,—In rising to deliver my address, my first duty is to offer you my sincere thanks for the honour you bestowed upon me in electing me your President for the year which is now fast drawing to a close. I beg to assure you that I thoroughly appreciate the honour, and I hope that during my year of office the Association has prospered as well as its most ardent well-wishers could desire.

Seeing you are invited to inspect the Waterford Gas-Works to-morrow, I will preface my remarks with a few particulars in respect to the manufacture and supply of gas in this ancient city. It is recorded in an old minute-book of the Waterford Cathedral Vestry, who were formerly the responsible authorities for lighting the streets, that gas was used for street-lighting as far back

as 1819. Thus, undoubtedly, Waterford has the distinction of being the first place in Ireland in which gas was used. The first gas-plant was erected and worked by a Mr. Benjamin Graham, and was used for lighting premises in which he carried on the business of ironfounder, engineer, &c. The premises were situated on the quay, at the place where the tower clock now stands. I am indebted to Mr. Benjamin Graham, a grandson of the aforementioned Mr. Benjamin Graham, for this interesting information. I have here the old minute-book referred to, which any of you who are interested can peruse; and you will there find that on the 16th of July, 1822, Mr. Graham entered into a contract to light the united parishes of Trinity with gas and oil, "the same as the last three years," &c., showing plainly that gas was used for public lighting in this city in the year 1819. In the same minute-book there are numerous other interesting entries as to the gas supply of Waterford in the early part of last century. In 1827, Mr. James Walpole tendered for the lighting of the parishes by gas in the name of the Waterford Gas Company.

As far as I can learn unofficially, the gas-works were transferred to their present site between the years 1830 and 1840, and were conducted, in a more or less satisfactory manner, by a Company until the year 1857, when Mr. George Anderson, my former chief, became connected with the Company. The following figures show the increased consumption of gas from that date, in periods of five years.

Year.	Consumption. Cubic Feet.	Year.	Consumption. Cubic Feet.
1858	16 millions.*	1883	38 millions.
1863	20 ,,	1888†	32 ,,
1868	22 ,,	1893	44 ,,
1873	28 ,,	1898	52 ,,
1878	32 ,,	1903‡	65 ,,

* Capital, £17,800; price of gas, 5s. 8d. per 1000 cubic feet.
† Public lighting by oil and electricity.
‡ Capital, £65,000; price of gas (average), 3s. 10d. per 1000 cubic feet.

From the foregoing remarks, you will see that gas lighting in Waterford has a history quite in keeping with this very ancient city. I would, further, draw your attention to the fact that the gas consumption of the city has doubled since 1888—a period of fifteen years. No account of the Waterford Gas Company would be complete without reference to Mr. George Anderson's long connection with it. He retired from the official life of the Company two years ago, after over forty years' service. I desire to pay here a respectful tribute to Mr. George Anderson, from whom, I am proud to say, I have received much valued encouragement and help in my career. Associated with the late Colonel Croll in the early days of gas lighting, Mr. Anderson, with his keen foresight and acumen, took advantage of what opportunity offered, and for many years apparatus of various descriptions, patented and improved by him, held their own against all competitors. In fact, there are many works all over the country, including Waterford, where you will still see Anderson's washers, scrubbers, exhausters, &c., doing their work efficiently. On Mr. Anderson's retirement from the Company, he was succeeded by his son, Mr. R. Bruce Anderson, who, I am glad to say, is to read a paper at this meeting upon a subject on which, it is well known, his father was, in his day, an authority.

During the past three years, considerable extensions have been carried out at the Waterford Gas-Works. New 16-inch, 12-inch, and 10-inch mains have been laid from the works to the various districts; and these will ensure an ample supply of gas to the consumers for many years to come. Some hundreds of cookers and slot meters have been fixed. Inside the works, all the connections have been re-arranged. Four new purifiers, 20 feet by 16 feet, with rubber joints, have been erected, as also a water condenser, sulphate plant, &c. A concrete gasholder tank, 86 ft. 6 in. by 18 ft. 6 in., has been completed. The construction of this was very difficult, owing to the bad foundation (peat) on which the gas-works stand. This tank was constructed, from plans by Mr. George Anderson, by the gas-works employees. A new three-lift columnless holder has just been completed; and we are now about to erect a new station meter, governor, and suitable house.

As I do not desire to weary you with our local affairs, I will now leave the Waterford Gas-Works, and say something on gas matters generally, with special reference to Irish gas affairs. I am pleased to be able to congratulate the members of this Association on the continued prosperity of the industry with which we are connected. In Ireland generally (and I can speak from personal knowledge for this part of Ireland), gas interests were never in so satisfactory a condition. This state of things is in no small measure due to the increased activity in the management of the several concerns. It certainly is not due to increasing prosperity in Irish towns, most of which, except perhaps in the North, have a declining population and vanishing or vanished industries. However, great things are expected from the Land Bill. When it becomes law, we, in common with others, may reasonably expect to benefit by any advantages to be derived by the people from it. The real cause of such progress as has been made is, I feel sure, the more progressive policy adopted within recent years by the directorates of gas undertakings.

When one comes to consider what are the duties of a manager of a medium-sized gas-works in Ireland, and how ably for the most part they are discharged, I cannot see why we should not be able to supply the gas companies in England, or elsewhere, with competent and experienced officials. There has been a good deal written and said about the training of the future leaders of the gas profession, and I would respectfully suggest to those who have the making of appointments that they possibly might do worse than obtain recruits from these shores. I venture to say that no better training or experience could be obtained than that which most of our members are receiving. To obtain successful results, a gas manager must be constantly on the alert. It is pretty generally known by his superiors what returns he ought to obtain from the coals he is using, and at what cost. He cannot depend on outside means, such as increased population, or increased national prosperity, to increase the consumption of gas. To obtain increased consumption, he must educate the public in the many advantages of using gas for lighting, cooking, heating, power, &c. We have an article which is indispensable to the general public, if they only knew it. A light sufficient for any moderate-sized room can be obtained for seven hours at a cost of 1d. for gas. [Whether 15 or 13 candle power gas is supplied makes little difference with the incandescent burner.] A dinner can be cooked for six persons at a cost of 1d. Over 1 brake-horse-power can be developed for one hour by a gas-engine at a cost of 1d. Do the public know this? Do they believe it? No. Then it is in this direction we have to look in order to increase our consumption of gas—by converting oil users to lighting by gas, coal users to cooking by gas, and steam-power users to driving by gas. With gas at a reasonable figure, the use of it for these purposes will result in a considerable saving to the consumer, without reckoning the utility of gas over oil, coal, and steam for the different purposes.

Managers of small works have often exceptional opportunities for promoting the interests of their concerns. Take the manager who has to read his own meter-indices and to collect the accounts. He meets every consumer at least eight times in the year; and he is constantly in touch with their requirements. I consider that all gas appliances should be fixed free, on hire or hire-purchase, with as few restrictions as possible. And in the interest of the public, it is absolutely essential that gas companies should undertake all interior gas-fitting, from the meter to the burner, at cost price. Under this arrangement only is it possible for any gas company to accept responsibility for the actual light obtained. As you are aware, most of the complaints received are entirely due to defects in consumers' fittings. As an instance, some time ago we received a serious complaint as to bad gas—really pressure—on a new job which had just been completed by a local plumber. On inspection, we found 22 lights connected on to a ½-inch pipe, and old, worn-out Bray's burners had been fixed on the new fittings.

It is all nonsense to require stamped legal agreements, sureties, &c., before fixing a slot cooker. I am convinced that these things prevent a large volume of business.

When the price of gas is over 5s., it cannot be economically used for cooking, &c.; and I am strongly of opinion that where the price cannot be reduced to that figure a differential charge for gas used for other purposes than lighting should be introduced. A paper was read at our Dublin meeting in 1899* which explained the system I would recommend.

There are now very few works indeed which have not, in some form or other, adopted the gaseous method of heating retorts. We are to have two papers to-day dealing with this interesting, and to us most important, subject; so I will reserve my remarks on this matter until the papers have been read.

From the results reported to have been obtained from the Settle-Padfield vertical retort, we would be justified in expecting this method of carbonizing coal to supersede both the inclined and horizontal retort systems. But experimental results are often not confirmed when the tests are made on a commercial scale. There is no doubt, however, that the patentees are to be congratulated on the results so far obtained from their system; and further results will be awaited with interest. Some years ago, I had an interesting experience of the difference between experimental and working results in connection with the Yeadon patent revolving gas-retort. Judged by the experimental results, this retort was going to revolutionize ordinary methods of coal carbonization; but after some months' trial, under ordinary working conditions, I regret to say that this highly ingenious method of automatic coal carbonization was pronounced a failure.

Condensation as affecting naphthalene has received a good deal of attention recently, and it is to be hoped that a solution of the difficulty, from which so many gas-works suffer, will soon be found. At Waterford, we have always been more or less troubled with naphthalene. At our works the gas, after leaving the hydraulic main, is carried round the retort-house wall and thence to the condensers. Two years ago, after putting a new condenser to work, I was of opinion that we had got rid of the trouble, to a large extent; but as the trunk mains had also been enlarged, I could not be sure that I was right in attributing the improvement to the condenser. I consider that the gas should be brought down to atmospheric temperature before it reaches the washer. I have found a considerable increase of temperature taking place in the exhauster owing to compression of the gas. For some time I was at a loss to understand why the temperature of the gas at the inlet of the washer (which is on the immediate outlet of the exhausters) was several degrees higher than at the outlet of the condensers. For dealing with naphthalene stoppages in

* See "JOURNAL," Vol. LXXIV., p. 484.

the district, we have found crude naphtha act well; and after putting it through services and mains, the whole of it (or a large proportion of it, certainly), can be recovered at the syphons, and used over again.

I am afraid that in many works in Ireland little attention is paid to the abstraction of ammonia from the gas. Apart from the commercial value of the ammonia, by not removing it you do considerable damage to your meters, and clog up consumers' fittings. Then, also, it is sometimes lost sight of that the ammonia so abstracted from the gas, in the form of liquor, acts in the washer and scrubber (especially if hydraulic-main liquor is put through the apparatus) as a purifying agent, in arresting part of the carbonic acid and sulphur, which would otherwise have to be taken out of the gas by the ordinary purifiers.

For purification proper. I have no doubt that, allowing for extra cost, it is economical in every way to have boxes of ample area. At the Waterford Gas-Works we have recently substituted four boxes, having an area of 1280 square feet, in lieu of four having an area of 400 square feet. Formerly, in midwinter, we often had to change two boxes in one day; now we change only six or seven boxes in the year, and are able to work up our spent oxide to from 55 to 60 per cent. of sulphur. In connection with the erection of these purifiers, it may interest some of you to know that the bottoms are of concrete only; the side and end plates having double flanges on the bottom, in order to give a bond for the concrete.

We are putting in a rotary meter to pass 30,000 cubic feet per hour, and will have a good opportunity of testing its registration, as the gas will also pass through the present station meter until we are satisfied as to its accuracy.

With the day consumption increasing, I do not think there is anything like the same necessity for large storage as formerly existed. In Waterford, during the summer months, the day consumption exceeds the night consumption; and, given holders in good working condition, I should be quite satisfied with storage for one-half the twenty-four hours' maximum output.

We are to have a paper on unaccounted-for gas, which is a wide subject, affording plenty of scope for discussion. In connection with this matter, I consider that all meters should be brought in and tested at regular periods, and that all meters should be tested before being fixed. Our practice is to test them every ten years. We have a system of painting all meters, fixed in any one year, with a distinctive coat of paint. We have ten standard colours, one for each year. Thus last year's colour was green, this year's brown, next year's will be blue, and so on. Meters fixed in 1893 had the same colour as has been given this year. One can thus see at a glance when any meter was fixed. This year all brown meters were brought in and tested.

Twelve months ago we introduced a maintenance scheme for incandescent burners, which has so far been a success. Our terms are 3s. per burner per annum for up to six burners, and 2s. per burner for each additional burner. We have upwards of 300 burners under contract, and consumers who have adopted the system are satisfied with it. All burners are examined and cleaned, and broken mantles replaced and chimneys and globes cleaned, fortnightly in winter and monthly in summer. Attention is also given between regular inspections, on receipt of a special request. The average cost per burner per annum—not including fitter's time—works out at 1s. 9d. per burner per annum.; and the average price received per burner per annum is 2s. 2d. So we have 5d. per burner per annum for fitter's time.

I wish to refer, before I close, to the South of Ireland Gas Association, which has been formed since our last meeting in Cork. I am sure there is ample scope for more of these subsidiary organizations in Ireland. Since this new Association was started, the meetings have been well attended; and they have had results with which the promoters are more than satisfied. The establishment of a lending library has, in particular, proved a great success. It is not expected that this new Society will ever have many members. The primary object is to enable the managers in this neighbourhood to meet regularly, to "talk shop," compare notes, and see what each is doing.

Professor C. R. C. TICHBORNE (Dublin) next delivered a lecture entitled—

ON SOME DETAILS OF THE ESTIMATION OF CARBON MONOXIDE.

I had the pleasure of reading before you on a previous occasion some notes on the estimation of carbon monoxide in carburetted water gas.* Further experience has shown me an improvement in making the solution then given, and used for estimating the carbonic oxide; and I determined to lay this before you as a supplement to the previous communication.

I illustrated to you the fact that a solution of cuprous chloride, dissolved in either an excess of ammonia or hydrochloric acid, and used in any of the approved gas-measuring burettes, is, by virtue of the power of that salt, capable of absorbing carbon monoxide as greedily as it also absorbs oxygen. It is used for the determination of that substance in water gas after the oxygen has been removed. The absorption of oxygen results in the production of a black compound, and ultimately of the green cupric oxide. It will also be remembered that I showed that the ammoniacal solution of the cuprous salt became blue on the absorption of the oxygen of the air—the hydrochloric acid solution becoming black. This black compound is probably a kind of half-way house, and consists of a compound of the two oxides of copper.

The hydrochloric solution is the one which, in practice, will be found most convenient, and it is the one most readily made. Hempel states that Drehschmidt says the ammoniacal solution is to be preferred to the hydrochloric acid one; but he does not confirm this by his own extensive experience. For all practical purposes the hydrochloric acid solution will be preferred in most gas-works, and is quite accurate enough, especially if a white solution be used which has a definite absorbing power. The making of the solution of cuprous chloride in hydrochloric acid, as sketched by me in my previous lecture, is not given in any of the books—namely, made by the direct action of cupric chloride on copper. Hempel gives two processes for making this solution. The first is by Winkler, and is based on the action of hydrochloric acid on oxide of copper and metallic copper reduced by hydrogen, using equivalent proportions of each. The second process is by Sandmeyer, and may, I think, be described as rather a roundabout method leading to the same results as those given by me. Copper sulphate and sodium chloride are boiled together, and hydrochloric acid and copper turnings are added. The whole is then boiled in a flask (connected with a condenser) until decolorized. The result is a solution containing cuprous chloride, sodium, sulphate, and hydrochloric acid. The process takes some time.

I will now give you some details of working the solution my way. It will be seen also that I have modified the proportions considerably, and that my acid is reduced in quantity. The acid does not play any part in the reaction, and is merely used in excess for the purpose of dissolving the cuprous salt. In a case in which I tried to reduce the acid down to equal parts of acid and water with 34 parts of cupric chloride (=50 Cu_2Cl_2) by continued boiling, a colourless solution was obtained; but this on cooling deposited about 75 per cent. of the cuprous chloride in large white crystals, if we have operated upon about 200 c.c. But this fact, although interesting as an experiment, shows that 50 per cent. of acid is not sufficient to make a permanent solution. I find that the minimum amount of hydrochloric acid which can be employed in making a strong solution is 75 per cent. The *modus operandi* is as follows: About half-a-dozen or more (according to your requirements) of 8-oz. stoppered bottles are procured. The stoppers of these bottles must be well ground in, and may be smeared with a little vaseline. The following ingredients are now introduced into each bottle:—

Crystalized cupric chloride	34 grammes.
Water	50 ,,
Hydrochloric acid	150 ,,
Copper	25 ,,

The copper used should be in the form of foil, and cut in strips a quarter-of-an-inch wide and 3 inches long. The stopper is inserted and tied down with string to prevent it falling out. The bottle is inverted and left in a warm place. In about three days the decomposition is complete, and the solution is colourless. The decolorization is hastened in a warm room. Each 100 c.c. of this solution represents about 25 grammes of cuprous chloride, and each will do two or three experiments.

The analytical absorbing power of this solution is 20 of carbon monoxide. It is much stronger than some used; but weak solutions are of little value. These transparent solutions remain so until the end of the experiments when used in the bottles I am shortly about to describe. You see what you are dealing with, and they are dependable as regards the work they will do. The ordinary bottle of cuprous chloride which you find at a gas laboratory is generally a deep black mass floating on a quantity of copper turnings. The absorption power of this solution is quite indefinite. It may be still active, or it may be just played out. It is necessary to bear in mind that the phenomenon of the conversion of white cuprous chloride into the black compound in no way makes it a measure of its power of absorbing carbon monoxide. If I place a little of the white cuprous chloride in an open test tube, and expose it to the air, it will gradually become brown, shortly afterwards black, and ultimately fine green again by being converted into cupric chloride. This experiment would take about a week to perform, even in dilute solutions; but I can show it to you in a few seconds, by using the oxygen from peroxide of hydrogen in place of the oxygen of the air.

On adding a drop of hydrogen peroxide to this flask containing some colourless cuprous chloride, a brown solution is instantly produced. On now gradually adding more, it gets darker, until it is the colour of the blackest ink; and on still pushing the addition of hydrogen peroxide, I ultimately get a beautiful green solution. [Experiment performed.] This is exactly what takes place in the air, only that it is condensed in a shorter period of time. The oxygen is transferred from the peroxide instead of the air:—

$$Cu_2Cl_2 + 2HCl + H_2O_2 = 2CuCl_2 + 2H_2O,$$

or we may represent it as follows:—

Cuprous oxide.	Hydrogen peroxide.	Cupric oxide.	Water.
Cu_2O	H_2O_2	$2CuO$	H_2O

Now we come to the apparatus for using this solution. We know from my previous communication all about the ordinary

* See "JOURNAL," Vol. LXXX., p. 560.

absorption and measurement of carbon monoxide in coal gas; and it is not necessary to go into this subject again. I may merely remark that, using the solution in my bottles, it is immaterial whether you are working Hempel, Bunte, or any other burette. We will suppose that you have 6 or 12, as the case may be, of these bottles of absorbing solution put up. It is quite immaterial as regards number because, when prepared as described, they will last for months. I have a tapering india-rubber stopper made, which fits my 8-oz. bottles. This stopper is bored with two holes, through which are passed two quill tubings. One goes down nearly to the bottom of the bottle, the other is inserted just through it; and outside each tube is closed with a small vulcanite tap. Besides this apparatus, another is provided. It is a very simple and small automatic apparatus to generate hydrogen. It consists of a tube closed at one end. The bottom is, however, pierced with five or six holes. About an inch of this is packed with broken glass, and then another inch with granulated zinc. I use mixed with this zinc a few shot of platinum. These shot produce a very uniform and steady generation of hydrogen when the acid comes in contact with them. Some years ago, I pointed out that such shot were much more desirable than platinum foil, which acted intermittently. When the surface of a piece of the foil became charged with hydrogen, it lost contact with the zinc, and floated to the surface of the liquid, discharged its gas there, and fell again by its weight on to the zinc. This objectionable phenomenon is removed by the employment of my platinum shot. The top of this tube is closed with a cork in which is inserted a small glass tap. This charged tube is placed in a cylinder containing diluted sulphuric acid (2 parts to 10 of water); and the small apparatus may be attached by a rubber tube to any bottle or burette, and will fill it at a moment's notice. It will last for months, if properly arranged, and it only stands about 10 inches high. When some of the cuprous solution is required, a bottle of the solution is quickly opened and the rubber stopper also quickly inserted. It must be remembered that the air space in one of these bottles is very little, and the air already there deoxygenated; and, as a rule, it will make no practical change in the solution. The bottle is now inverted into the ring of a retort, and the long stand tube is connected with the hydrogen apparatus. The tap of the last is then open, and as the solution is used out of the bottle, it is replaced automatically by hydrogen.

[The lecturer concluded by making an illustrative experiment.]

Mr. R. Bruce Anderson proposed a vote of thanks to Professor Tichborne for the valuable lecture with which he had favoured the members. On the authority of Miles Standish, if they wanted to do a thing well they must do it themselves; and the Professor had shown them in what way they could set about doing it in gas-works chemistry. The darkening of the cuprous chloride solution had certainly been regarded as a great nuisance. Professor Tichborne had, by his interesting apparatus, shown how they might use the solution without the darkening troubling them.

The Hon. Secretary seconded the vote of thanks. He said he knew that the Professor had come there at considerable inconvenience to himself. He had been unwell of late, and laid aside from his work; but he had very kindly agreed to give them his lecture. They had had several lectures from him. It was a good while since he became an honorary member of the Association; and he (Mr. Whimster) supposed that while they were now thanking him for the past, they did so in the hope of favours to come.

The President said he should like to support the vote of thanks. Though Professor Tichborne seemed to think that his lecture that day had not been of so much importance as his previous lectures, he (the President) was sure it had been of equal value. To his mind, the main thing about the lecture was that anyone of them could, at very little expense, construct the apparatus with which the lecturer had demonstrated; and he thought it was a great thing for managers of small gas-works, with regard to doing anything in the line of chemistry, that they should be able to make the apparatus they used as simple as possible. He had been very much interested, as, he was sure, all the members had been, in the lecture.

The vote having been warmly accorded,

Professor Tichborne said he was very much obliged to the members for their reception of the little instalment pertaining to gas chemistry which he had given them. He might be repeating himself, but he did believe that there was a future for water gas, which they would have absolutely to meet. He believed also that there was a life for gas in its entirety, and that there would be a great many changes before they were done with it. He thought the President said in his address that gas was first used in Ireland in 1819. Well, they would soon have reached 1919, and gas would not be done before then. It was prognosticated some years ago that it would. But he was inclined to prophesy that they would still see gas in existence and working—and he gave that from observation of many things he saw around him—in 2019; and he thought that would be long enough for either them or him, or even for the shareholders.

Reading of Papers.

The reading of papers was then commenced. The first was on "Gaseous Firing at the Waterford Gas-Works," by Mr. R. Bruce Anderson, of Westminster; and the second on the "Progress of Regenerative Firing Since 1880," by Mr. W. Dunn, of Queenstown. They will be found in another part of the "Journal." As they were upon similar subjects, it was agreed to hear them read, and to discuss them together. The paper contributed by Mr. J. Paterson, of Tipperary, on "Unaccounted-for Gas" is given on p. 441.

Votes of Thanks.

The Hon. Secretary said that before they separated he would like to ask them to accord very hearty votes of thanks, first of all to the Mayor and Corporation of the city of Waterford, for their kindness in placing the room at their disposal for the meeting; in the second place, to Professor Tichborne, for coming there and delivering his lecture, which was so interesting to them; and, in the third place, to the President, for his able and dignified conduct in the chair.

Mr. Frizelle seconded; and the motion was agreed to.

Professor Tichborne thought he had already responded to the kind way in which they had received his lecture, and the thanks they gave him before; and therefore it would only waste their time to enlarge upon it.

The President returned thanks, and expressed the pleasure he had had at the attendance there had been. When it was decided to have the meeting at Waterford, he was afraid they would have a very poor meeting, on account of the difficulty there was in members getting to it. He was quite pleased with the attendance, but would have liked to have seen more of the northern members present.

Mr. A. Mackenzie moved a vote of thanks to the Hon. Secretary.

This terminated the proceedings.

Annual Dinner.

In the evening, a large party of members and their friends, as well as of citizens of Waterford, sat down to dinner in the Imperial Hotel, on the invitation of the City of Waterford Gas Company. Mr. R. Bruce Anderson, on taking the chair, explained that he did so in the absence of Mr. George Lynch, the Chairman of the Company, who was unable to be present, but who wished to extend a cordial welcome of the Association to Waterford. The Chairman proposed the toast of "Success and Prosperity to the City and Corporation of Waterford." In the course of his acknowledgment of the toast, Mr. Councillor A. Nelson, J.P., D.L., stated that the Corporation had just entered into a contract for five years with the Gas Company, for the lighting of the whole city with incandescent gas-lamps. The contract, he believed, would redound to the credit of the Corporation, and would be a benefit both to the community and the Gas Company. He looked upon it as a step in the direction of progress and prosperity. Mr. Nelson proposed "Success and Prosperity and Extended Usefulness to the Irish Association of Gas Managers," which Mr. Tooms and Mr. Whimster acknowledged. Mr. Tooms proposed "Prosperity to the City of Waterford Gas Company." Mr. Anderson, in acknowledgment, said that the retort-house in use now was the same as in 1857; that at that time it was full of retorts; and that such had been the progress of gas engineering since then, that last winter, with an enormously greater consumption of gas, only half the house was in use.

In the evening a long musical programme was gone through, the excellence of which was generally admired. For its organization and direction, the Association were indebted to Mr. G. W. Norman. During the concert, the temperature of the room was taken below one of the two four-light gaseliers, and it was found to be only 71°. This result the Chairman thought was highly satisfactory, considering the crowded condition of the room. The dining-room was brilliantly lighted by eight incandescent gas-lamps. The outside of the hotel presented no less brilliant an appearance under the light of an installation of Lucas lamps.

Visit to the Gas-Works and the Excursion.

On Wednesday, the members paid a visit to the gas-works and after luncheon they went on an excursion to Dunmore and Tramore, on the southern coast of Ireland. Dinner was served at the latter place. On the return to Waterford, the party, which was one of the happiest, separated, after an enjoyable drive.

Mortar for Use in Flowing Water.—The following recipe has been given for mortar to be used on work located in a stream of water flowing under pressure: Two parts of cement (three in case of great pressure) and one part of sand mixed dry, with powdered charcoal added to assist the adherence of the oil varnish to be put in afterwards. Dissolve 10 drachms of sea salt in $1\frac{3}{4}$ pints of water, and add $1\frac{3}{4}$ oz. of potash lye. The liquid is heated to a temperature ranging from 80° to 100° Fahr., and used for bathing the mixture of cement and sand. The material must be used at once, as it hardens quickly. When employed to stop large openings through which the water is running under pressure, the mortar should be first applied round the edge and gradually worked towards the centre, which can then be closed with a large piece. All is then held in position for a minute with a piece of board. The mortar when set is very resisting to water.

INCLINED v. HORIZONTAL RETORTS.

Readers of the "JOURNAL" will recollect the controversy raised on the above subject by Mr. Brown's paper at the meeting of the American Gaslight Association last year, in which he set forth the reasons for not building inclined retorts at Milwaukee.* Mr. George G. Ramsdell, of New Bedford, has contributed an interesting item to the discussion, by sending to the "American Gaslight Journal" the results of the first 27 consecutive days' operation (June 8 to July 4) of the inclined retorts in the establishment of which he has control. Notwithstanding the adjustments necessary to ensure a proper working of the furnaces and the training of men entirely new to the duty of manipulating inclined retorts, the average production of gas per retort, making no allowance for conditions peculiar to the starting of new works, was 18,202 cubic feet, or at the rate of 145,616 cubic feet per day for a setting of eights; while for the last twelve days of the time the average was well over 20,000 cubic feet, or upwards of 160,000 cubic feet per setting. On one day, the make in twelve retorts was 251,350 cubic feet, or equal to 167,568 cubic feet for eight. Mr. Ramsdell considers these figures furnish abundant proof that a setting of eight 20-feet retorts will produce, week in week out, 160,000 cubic feet of gas per day, using standard American gas coal. His results were obtained with six-hour and five-hour charges; but he thinks when four-hour charges are adopted, from 21,000 to 22,000 cubic feet will be as easily produced, or equal to a production of 170,000 to 175,000 cubic feet per day.

Mr. Ramsdell has taken the figures in Tables A, B, D, and E in Mr. Brown's paper, and added a column based upon the make of 160,000 cubic feet per day. We reproduce the tables below.

TABLE A.—*Working Capacity of 4,000,000 Cubic Feet per Day.*

	Horizontal. Eights.	Inclined. Eights.	Inclined. (Ramsdell.)
Make, cubic feet	90,000	135,000	160,000
Life, days	900	900	900
Life in 1000 feet made	81,000,000	121,500,000	144,000,000
Cost of resetting	$550	$1250	$1250
Do., per 1000 cubic feet	$0·0068	$0·0128	$0·0087

TABLE B.

Col. 1.—Two stacks of 24 settings of horizontal retorts, eight in a setting; retort-house 350 ft. by 72 ft. = 25,200 square feet, and 40 feet high.

Col. 2.—Four stacks of eight settings of inclined retorts, eight in a setting; retort-house 474 ft. by 50 ft. = 24,000 square feet, and 48 feet high.

Col. 3.—Three stacks of nine settings of inclined retorts, eight in a setting; retort-house 360 ft. by 54 ft. = 19,500 square feet, and 50 feet high.

	Col. 1.	Col. 2.	Col. 3.
Cost of house, including stage floors	$85,000	$106,000	$86,580
Foundation on piles	6,000	7,500	6,045
Coke-conveyors	15,750	12,500	..
Coal-elevators, &c., each 50 tons per hour capacity	15,000	15,000	15,000
Charging apparatus for inclines	..	9,600	8,100
Stoking machinery, compresser, &c.	32,000	..	..
Coal-bins, 30 hours' supply	6,000	12,500	10,065
Benches	144,000	249,600	212,288
Bench foundations on piles	10,500	9,200	7,763
Connections and drains	4,000	3,000	2,531
	$318,250	$424,900	$348,372
Land, at $60 per lineal foot	21,000	28,440	21,600
	$339,250	$453,340	$369,972
Interest at 5 per cent.	$16,962·50	$22,667	$18,498·60
Depreciation at 5 per cent.	16,962·50	22,667	18,498·60
	$33,925	$45,334	$36,997
	Cubic Feet	Cubic Feet	Cubic Feet
Make of 250 maximum days	1,000,000,000	1,000,000,000	1,000,000,000
Cost per 1000 feet made for interest and depreciation.	$0·0339	$0·0453	$0·0369

TABLES D AND E.

	Horizontal.	Inclined.	Inclined. (Ramsdell.)
Labour costs per day	$110·00	$105·25	$88·83
,, ,, 1000 feet	$0·0275	$0·0263	$0·0222

TABLE F.—*Summary.*

	Horizontal.	Inclined.	Inclined. (Ramsdell.)
Table A	$0·0068	$0·0128	$0·0087
,, B	0·0339	0·0453	0·0369
,, D and E	0·0275	0·0263	0·0222
Total	$0·0682	$0·0844	$0·0678

* See "JOURNAL," Vol. LXXX., p. 1209.

GASEOUS FIRING AT WATERFORD—PROGRESS OF REGENERATIVE RETORT SETTINGS.

At the Meeting last week of the Irish Association of Gas Managers (*ante*, p. 429), two papers, the short titles of which are given above, were read and subsequently discussed together.

I.

GASEOUS FIRING AT THE WATERFORD GAS-WORKS.

By R. BRUCE ANDERSON, Assoc.M.Inst.C.E.

During the past fifteen years, the writer has been responsible for the design of the retort-settings in some half-a-dozen Irish gas-works, with the general management of which he has all the time been intimately associated. The present Waterford settings are the result of his experiments and observations, after various modifications of his original designs. Being able to arrange to have samples of the settings at work and others opened out for repairs, he felt it would be of interest to the members to have a description of them—preceded or followed by an inspection of the actual structures. When he first became connected with the Waterford Gas-Works in 1886, the make of gas was about 35 millions per annum; it is now about 70 millions. The retorts then were all direct-fired, in settings of sixes and nines; and the make averaged about 4000 cubic feet per mouthpiece, and 10,000 cubic feet per ton of Ravensworth Pelaw coal, with a coke sale of 8·2 cwt. per ton of coal. Now the settings are eights, sevens, and sixes; and the make averages 6000 cubic feet per mouthpiece—rather over 10,000 cubic feet per ton, with a coke sale of 9·2 cwt. per ton after firing benches and exhauster boiler. Considering the damp foundations, that stale coal has to be used, and the magnitude of the works, the author feels that neither the old nor new results can be justly animadverted upon. The figures are not results of short experiments on selected settings, but of whole years' workings of all settings used, based upon the total coal bought and weighed and coke sold by weight.

In designing the settings, the following points were kept in view: (1) Low prime cost; (2) avoidance of special fire-goods; (3) avoidance of excavation; and (4) ease of working.

In view of the high proportion idle bears to used plant, the cost should be kept low, as it is no use having economical settings if the saving, during the short time they are at work, does not exceed the interest on their cost. Expensive idle settings are often left out of account when comparing prices and results; and savings are shown upon the assumption that beds are kept at full work except when off for repair—the idle summer settings not being brought into account.

The adoption of any special forms of bricks gives rise to various drawbacks, apart altogether from their original cost. The stock of ordinary fire-goods is already varied enough, and carrying an additional reserve stock of specials becomes irksome, and one is apt to be out of the precise article at the time it is wanted, with the result that, rather than wait to procure it, one cobbles up the job with ordinary patterns. Thus, unless there be a material advantage, the author deprecates using specials, even though their use might be cheaper and less troublesome in the first instance.

Where foundations are waterlogged, as is the case at Waterford, it is not desirable to resort to underground chambers. One is often assured that there is no difficulty in keeping the water out. That may be so for a time; but in many cases, where engineers have tried it, they have regretted that they did not go up with their retorts, rather than down with their producers.

The easier and safer one can make the work for the men, the better attention the work is likely to get. The writer has often pitied men clinkering furnaces down in small slushy pits, with scorched and scalded limbs, and knuckles barked against the pit-walls. Clinkering should always be well done; but it is impossible to maintain good clinkering under disadvantages. It is advisable to provide a good foothold for the stokers; and ashpit plates do not give a good, uninterrupted footing.

In his first designs, the author endeavoured to nest the producer in among the retorts; keeping his pit as shallow as possible. Very good fuel results were so obtained; and the sevens in use at Waterford are the outcome of various attempts, and give very satisfactory results. But for durability and general comfort in working, they are not so good as the eights and sixes fired from external producers. It struck him, however, that in comparatively small works—where ground-space was not of so much account as in larger works—it would be an advantage to take the producer out from the retort-arch altogether and put it in an arch adjoining. In the year 1894, he accordingly experimented on such an installation at the Tipperary Gas-Works, where he had two arches available. The two arches adjoined, and were 4 ft. 6 in. and 2 ft. 6 in. wide respectively, by 8 ft. long. A producer was set in the narrow oven, and heated five retorts in the wider one, with the result that one could easily put a melting heat on the retorts, and the five were able to make more gas than the eight retorts formerly set in the two ovens. Using an external producer for so few retorts savours rather of cracking walnuts with a sledge-hammer; nevertheless the fuel and other results were an improvement upon the old direct-fired settings at Tipperary.

The next step was to adopt the system at Fermoy, where the

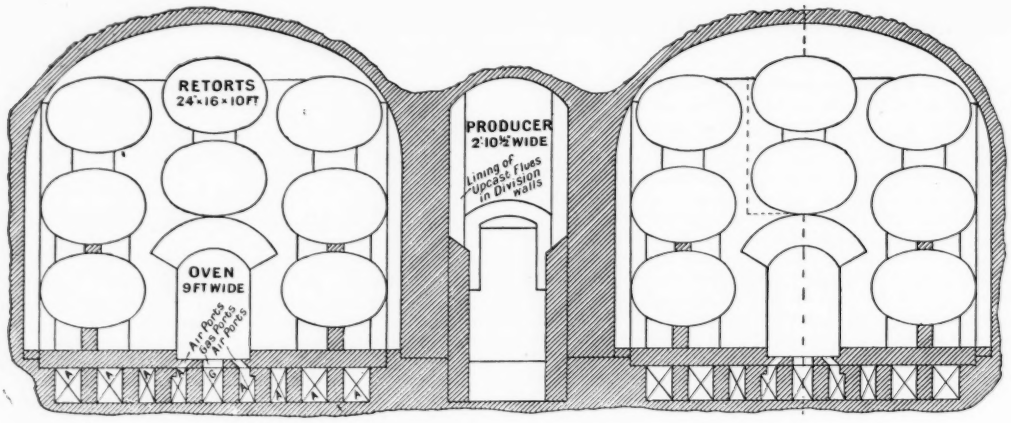


FIG. 1.—EXTERNAL PRODUCER HEATING SIXTEEN RETORTS.

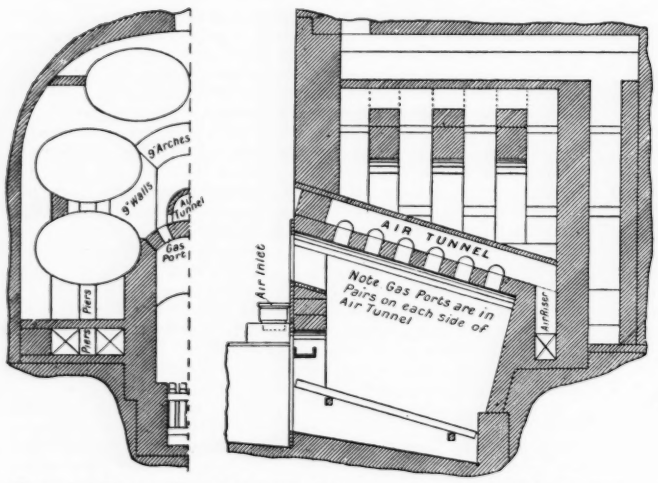


FIG. 2.—CROSS SECTION AND LONGITUDINAL SECTION OF THE INTERNAL PRODUCER SETTING.

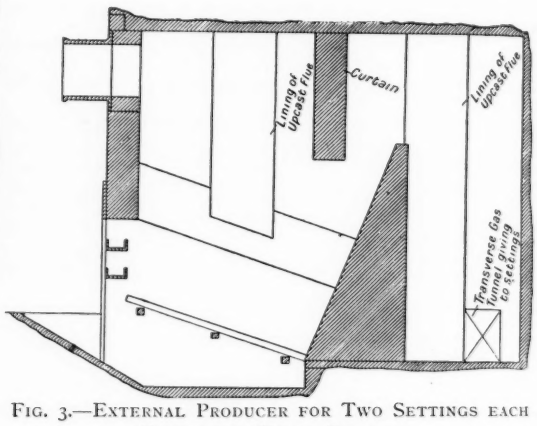


FIG. 3.—EXTERNAL PRODUCER FOR TWO SETTINGS EACH CONTAINING EIGHT RETORTS.

author was troubled with flood water, and was erecting a new oven above the flood-level in an old coal-store adjoining the retort-house. There was room for an oven 8 feet wide and a producer arch. These were accordingly erected; and they give satisfaction both as to fuel and make per mouthpiece. In this installation, six large retorts were set in 1896. Being satisfied as to the efficiency and reliability of the system, the writer felt confidence in adopting it for the new setting he was designing to fill the retort-house at Waterford. The installation consisted of two ovens and the producer shown in fig. 1, with another wide oven, and narrow producer arch to the left—in all, three ovens and two producers. The arches were erected and set in 1897; it being contemplated to heat another oven to the left of the producer (not shown) when the arches to the left of it were rebuilt, which intention was carried into effect last year.

In the first instance, the system was applied in the two ovens shown, which, containing sixteen retorts, were heated from the producer. These identical retorts are now in use; the only renewals being a front half-retort to the bull's-eye of the left arch, and a similar front half to the bull's-eye of the other setting, which were both put in after the first season's work. Further experience has proved that there was some exceptional reason for their being required, as those put in to replace them have run all right.

Being perfectly satisfied with these settings, the reconstruction of the retort-benches was proceeded with on the same lines. Back to back with them were demolished some old arches, and a similar pair of arches was erected—only, instead of putting the producer in between them, it was put on one side of them, at the end of the house. These worked equally satisfactorily; there being no material difficulty in heating both ovens on one side of the producer. The next step was to reconstruct the left-hand end of No. 2 retort-house, in which the first installation had been erected. In the old ovens, where it was not convenient to adopt the external producers, the semi-generators have been introduced as occasion arose for their being re-set. A description of these two systems will now be given.

Fig. 2 shows a half cross and a longitudinal section through the oven of the semi-regenerator. The producer is kept as high as possible at the front of the setting; the clinkering being done by inserting temporary bars above the clinker and withdrawing the ordinary furnace-bars. The producer gas escapes through ports left and right of the centre, through a 4½-inch arch forming the crown of the producer. This arch carries a special saddle-tile—the only special used—through which the secondary air is distributed through the side holes in same arranged in juxtaposition to the gas-ports. The secondary air is heated by being allowed to travel slowly through the chequer-work below a false bottom built to form the sole of the oven. This air is collected in an upcast formed in the back wall of the producer, whence it gives into the saddle-tile distributor. The air-conduits are made amply large to allow dust to deposit during the working life of the setting without causing any trouble. The heat is taken over the middles, down under the bottoms to the back, where it rises behind a division wall in a chamber 12 inches wide at the back of the retorts (which thus get the last of the heat), and then escapes through a nostril in the top of the arch to the main flue, which is on top of the beds.

At Tipperary, during three months of mid-winter last year, with a six-bed and seven-bed at work set on this principle, the coke sale averaged out at 10·3 cwt. per ton of coal; but there the foundations are dry and the coke is never stocked.

Fig. 3 shows a longitudinal section through the producer, the construction of which is so simple as to hardly call for description. The producer gas passes under the curtain and over the back wall down to the ground level, whence it passes laterally to the settings. An important feature is the curtain, which causes a constant head of fuel to be subjected to the draught—so maintaining a regularity in the constitution of the gas and a constant amount of friction in the producer, which means a regular draught on the secondary air. The space above the bottom of the curtain in front serves as a reservoir for coke; so that the producer can be charged at long intervals with no disturbance of its regularity of working, and by the time the fuel reaches the zone of combustion, it has already been heated to redness.

Some months ago, Mr. Herring, of Edinburgh, took out a patent for this curtain, when I communicated to the Technical Press that we had been using them for years. In the admirable description of his Granton settings, he refers to others having used these curtains, but says: "It, however, only appears to have been an accident or an incident of construction, and not a deliberately devised means for securing the production of a gas of uniform quality throughout." [See "JOURNAL," Vol. LXXXI., p. 617.]

The advantages so well described by Mr. Herring have been in my mind, and I think in the minds of others, for years; and the following extract from a letter dated June 28, 1898, written to the

Resident Manager of the Waterford Gas-Works, clearly indicates my use of the curtain to have been no mere incident, but deliberately devised: "I return your tracing. The only alteration you have made which I do not agree with is the abolition of the curtain. The curtain I consider vital to the success of the producer, for the following reasons: (*a*) The draught is more or less horizontal, as pencilled, instead of vertical, as in red ink. (*b*) You have a constant depth of fuel with curtain for primary air to go through, whereas without curtain, as fuel burns down, a less depth is exposed, and the balance of secondary air is upset. (*c*) Without curtain, clinker will give trouble inside front wall. (*d*) Without curtain, when firing air goes in on top of fuel, carrying dust with it, burning and fluxing up flues behind back bridge. The curtain effectually prevents coke going over back bridge; but that was not my reason for using it. The curtain should be carefully built to crown and sides of producer, to allow no leakage past it."

Over-anxiety to utilize the space conduced to various errors being committed, as in the earlier designs the back of the producer was given a slope so as to form a larger furnace, but dust from the reduction combustion of the fuel rested on the slope, and was the cause of trouble. Sharpening the slope cured the complaint. Also, in one instance, a regenerator was built in the back-half of the arch. It did very well, but was not repeated.

Fig. 1 shows a cross section through the eight beds. The producer gas enters laterally at the back, is brought to the centre at the back, and then to the front in the centre of the oven, distributing through the ports in the top of the longitudinal tunnel as it advances. On either side of the gas-tunnel is an air-tunnel, out of which secondary air is distributed through ports in juxtaposition to, and deflected on, the gas-ports. The secondary air is heated by being made to flow slowly from the front through the chequerwork under a false bottom forming the sole of the oven, returning in the air-tunnels towards the front, distributing as it travels. The heat passes up over the middles, down below the bottoms, escaping fore and aft, left and right, into upcast flues formed in the walls dividing the ovens from each other; there being four off-lets from each oven, one at each corner, each separately controllable.

The author has taken out the cost of the original installation of three ovens and two producers, as in fig. 1. Excluding the chimney, the cost was as follows:—

Bricks for arches	£101
Bricks for settings	118
Retorts for settings	72
Labour, erecting and mounting settings	133
Ironwork	218
Foundations	15
Total cost of 24 retorts	£657

Equal to £27·4 per mouthpiece.

It is estimated that each of the original retorts still in use has made 8 million cubic feet of gas; so that if the whole installation were now scrapped the wear-and-tear charge would only have cost 0·82d. per 1000 feet. As it is, the arches and ironwork remain perfectly good, and only the retorts need renewal.

In the following table is given a record of the life of each of the two original ovens now at work for your inspection, from which you will see that one has been used for six seasons, and worked for 1450 actual working days, and the other for six seasons and 1500 days. The second table shows the life record of settings back to back with the first ones, which have been opened out for your inspection before being repaired:—

Life Record of Benches Nos. 5 and 6, New House.

No. 5. Set in 1897.				No. 6. Set in 1897.			
Fired.	Quenched.	Days Used.	Repairs.	Fired.	Quenched.	Days Used.	Repairs.
10/12/97	28/1/98	50	Sharpened slope of back of producer.	10/12/97	28/1/98	50	As No. 5.
4/2/98	19/5/99	470	New front half to bull's-eye. Tunnel enlarged. Producer relined.	4/2/98	19/5/99	470	New front to bull's eye. Rest as No. 5.
		520				520	
1/12/99	4/5/00	155	Nil.	1/12/99	18/5/00	170	Nil.
		675				600	
12/10/00	15/2/01	125	Slight patching. Mouthpieces refixed. Flues cleared.	12/10/00	15/3/01	185	As No. 5.
		800				875	
27/9/01	23/1/03	480	Retorts patched. Producer relined. Flues cleared.	27/9/01	26/12/02	455	As No. 5.
		1280				1330	
13/2/03	*31/7/03	170	*Still working.	13/2/03	*31/7/03	170	*Still working.
		1450				1500	

Life Record of Benches Nos. 1 and 2, Old House.

[Back to Back of Nos. 5 and 6 of New House.]

No. 1. Set in 1898.				No. 2. Set in 1898.			
Fired.	Quenched.	Days Used.	Repairs.	Fired.	Quenched.	Days Used.	Repairs.
16/12/98	23/6/99	190	Producer refurnaced	16/12/98	7/4/99	110	As No. 1
13/10/99	23/11/00	400	Producer relined and flues cleared.	13/10/99	23/11/00	400	,,
		590				510	
2/8/01	11/4/02	250	Producer lined. Close frame fixed. Retorts patched. Flues cleared.	2/8/01	11/4/02	250	,,
		840				760	
15/8/02	*30/6/03	300	*Still working.	5/9/02	10/4/03	220	
		1140				980	

During last winter, these settings were at work, and notwithstanding their age the make per mouthpiece averaged well over 6500 cubic feet—sometimes 6400 cubic feet over a whole week, counting every retort heated, whether off for scurfing or not.

The writer is well aware that in larger works much longer lives than these are recorded. Mr. Carpenter reckons upon 2400 days for his horizontal retorts in London; but the circumstances are not comparable. In a small works, there is much hanging fire and alternation of working, which is very detrimental to the life of settings; whereas in a large works most of the settings can be kept in regular use and all the alternations taken up on old benches ready for renewal. This is aimed at even in small works, but is not nearly so easily done.

The writer is also well aware that retorts running 1000 days under fire are spoken of with pride by their guardians, and that some even advocate renewing settings every season—giving only some 300 days' existence. This may pay for a works at Stourbridge or elsewhere adjacent to the retort works; but where fire-goods have to be conveyed a long journey, and retort-setters are difficult to get, the life of a retort is a consideration.

Although two ovens are fired from one producer, there is no difficulty in working both together or either of them separately. Intelligent care has only to be exercised to avoid explosions when firing up. When letting down a single oven, the front wall is opened, and ready luted tiles lifted in and deposited over the gas-ports. The facility with which this can be done inclines the author to look upon the future retort-house as one with a producer at each end of the house for alternate use as one requires repairs—a setting at a time being shut off as it becomes unnecessary or requires repairing. The fear of putting too many eggs in one basket has alone deterred him from adopting such a design in the works he is connected with.

As will be seen from inspecting the ovens opened out for repair, the internal construction is very simple, and such as any retort-setter could easily erect with a minimum of supervision. At the same time it pays to employ a thoroughly competent man for even the simplest design. The same applies to the management of the ovens. Identically the same design gives very different results in the hands of different managers. At Waterford, the Company have been fortunate in their Resident Managers taking a keen and intelligent interest in managing their settings.

Gaseous furnaces require more skilled attention than direct-fired settings. One is very apt to attribute a going back in heats to a wrong cause; and years of experience have convinced the author that a manager should obtain and use a gas-testing apparatus if he wishes to get the best results from his benches. Even with direct fires, it is desirable; with gaseous fires, it is indispensable. The use of the Orsat apparatus is so simple that the author has taught its use in one afternoon to managers whose knowledge of chemistry was most elementary, who, in turn, have taught it to their foremen, whose chemical knowledge was *nil*; and they have all found it of immense advantage. Here, in Waterford, the apparatus is in use weekly at least, when all is going well; and should a bench be "off-colour," the apparatus is kept constantly at work until the cause is ascertained. Once the cause is known, the remedy is generally simple enough. There are many good rough-and-ready ways of observing settings, but none so reliable as a chemical test.

The following table gives picked analyses of flue gases made at Tipperary and Waterford, in the ordinary course of working, by the Resident Managers, Messrs. Paterson and Tooms:—

Flue Gases.

Tipperary. Semi-Generator.			Waterford. External Producer.		
CO_2. Per Cent.	CO. Per Cent.	O. Per Cent.	CO_2. Per Cent.	CO. Per Cent.	O. Per Cent.
19·3	0·1	0·2	19·0	0	0·4
18·9	0·3	0·1	19·3	0	0·3
18·6	0·1	0·5	19·0	0	0·2

Below I give another table of results of tests made by Mr. Tooms of producer gas at Waterford from the external producers. The semi-generators do not enable one to test very successfully.

External Producer Gas.

CO_2. Per Cent.	CO. Per Cent.	O. Per Cent.
6·4	25·0	0·0
7·6	22·0	0·2
8·0	22·4	0·0

For comparison, I give some analyses made at various works by myself when on my visits of inspection:—

Producer Gases.

Type of Producer.	CO_2. Per Cent.	CO. Per Cent.	O. Per Cent.
External producer	8·5	21·5	0·0
Semi-generator	7·1	21·5	0·0
External producer	7·0	23·0	0·0
External producer	6·4	19·7	0·3

Flue Gases.

CO_2. Per Cent.	CO. Per Cent.	O. Per Cent.
13·0	0·0	2·6
14·5	0·0	2·3
16·0	4·2	0·2
17·4	0·0	0·0
11·6	0·4	5·6
16·6	1·8	..
16·0	0·2	0·3
18 2	0·0	0·0

Among these is one exceedingly bad one—the only one that was made over a direct-fired setting; and the extravagant superfluity of air is strikingly apparent. The 5·6 per cent. of oxygen must have been accompanied by 22 per cent. of nitrogen; making about 28 per cent. of unnecessary air heated by the setting to the temperature of the main flue.

By the kindness of Mr. Charles Carpenter, I am able to append an analyses of gases from his large producers and settings at the South Metropolitan Gas Company's works, which he sent me after seeing the picked analyses I have submitted to you, on which he was good enough to comment that our flue gas is very good, and that there is not much fault to be found with our producer gas considering the size of our furnaces.

Analyses of Gases.—Mr. Carpenter's Large Settings.

	CO_2. Per Cent.	CO. Per Cent.	O. Per Cent.
Producer gas (average)	2·4	28	nil
Flue ,, ,,	17·0	nil	2·2

Average B.T.U. 128.

II.

PROGRESS OF REGENERATIVE SETTINGS SINCE 1880.

By W. Dunn, of Queenstown.

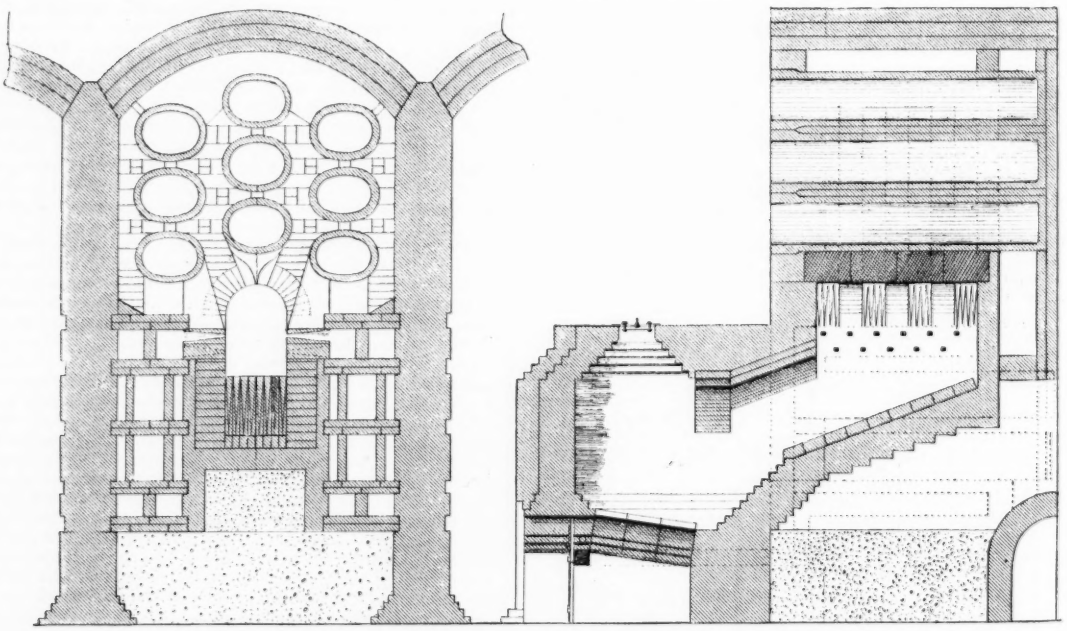
In this paper, it is proposed to deal with regenerative furnaces as applied to heating gas-retorts, and to show that there has been practically no improvement in construction, or results obtained, for the past twenty-three years.

This is no new subject, but one which has been thoroughly thrashed out from time to time, at gas managers' meetings, with beneficial results to the gas industry. Much has been achieved; but anything approaching theoretical efficiency has not yet been obtained, although our Continental neighbours, by the adoption of corrugated retorts, come very near the mark.

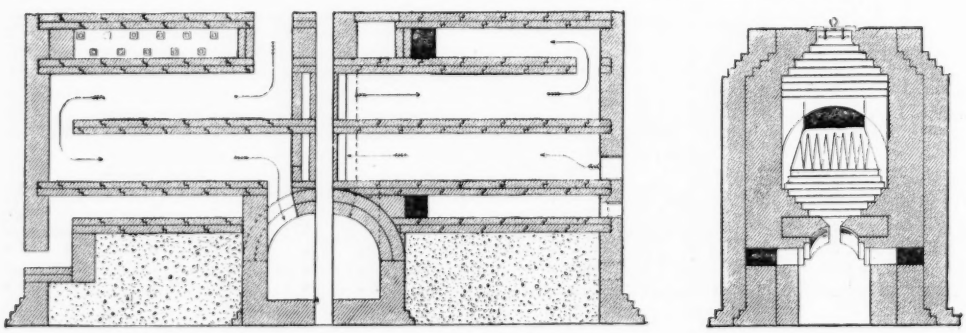
Almost all the gas managers have their own pet patent regenerative settings of some kind or other, more or less useful; but most of them introduce unnecessary and costly complications, and, in some cases, settings of fragile construction and of doubtful utility —some of such settings costing as much as £50 per mouthpiece. Gaseous firing is now becoming general, and its principle is well understood, for which we are indebted to many of our professional brethren, among them being the late Mr. G. E. Stevenson, and Messrs. Carpenter, John West, A. Valon, and G. R. Hislop.

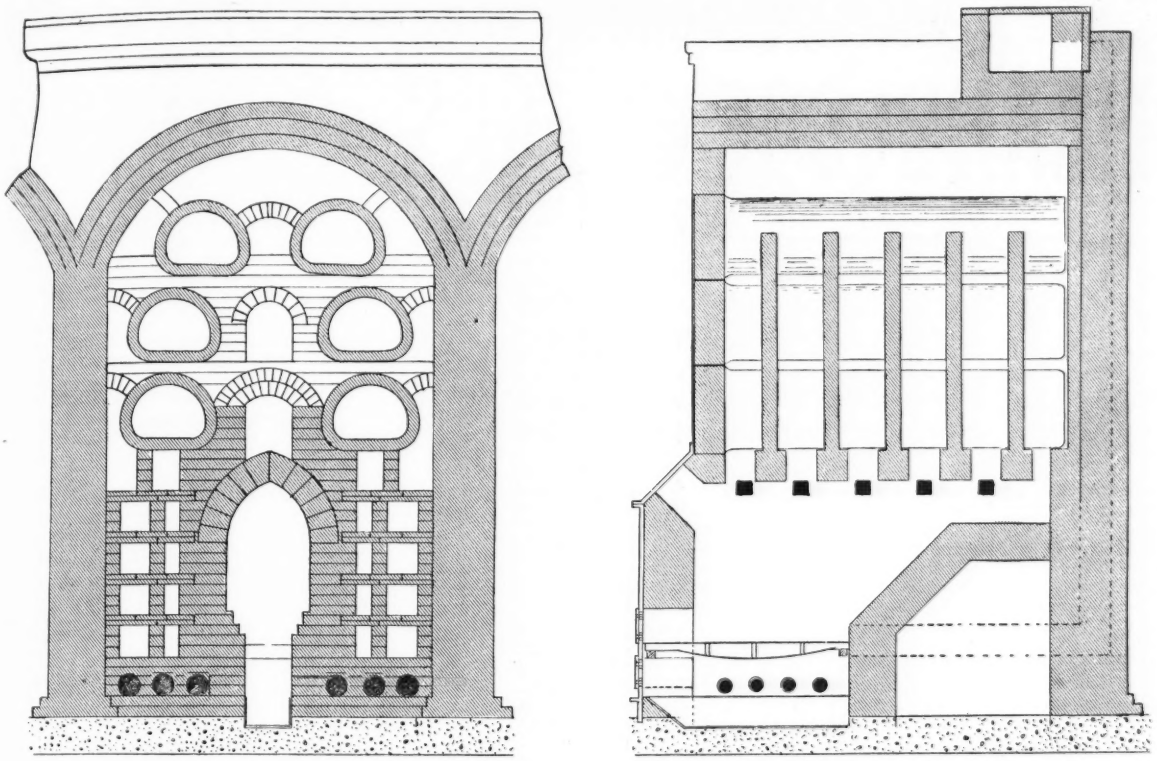
The most important advantages to be gained by the adoption of gaseous firing are the control of the process of combustion and the regulation of the chemical actions taking place in the producer and setting; and uniform heat of retorts with a minimum consumption of fuel, which cannot be obtained in an ordinary direct-fired setting. Clinkering with a modern setting is now nearly abolished. This laborious operation with direct firing is necessary every 8 hours; but with a regenerator, it is only necessary once in 48 hours, and the refuse is removed as ashes without in the least affecting the heat of the setting.

The author understands that Siemens settings have been in use at the Paris Gas-Works for over thirty-seven years, and are still employed in preference to all others. They differ from the regenerative settings as used in this country inasmuch as, instead of utilizing the waste gases to heat the secondary air by transmitting their heat through the walls of flues, in the Siemens' setting the waste gases are used to heat up a chequer brickwork chamber at either side, and the flow of waste gases is reversed every hour—that is to say, while the waste gases are passing through one chamber, the secondary air is traversing the chamber

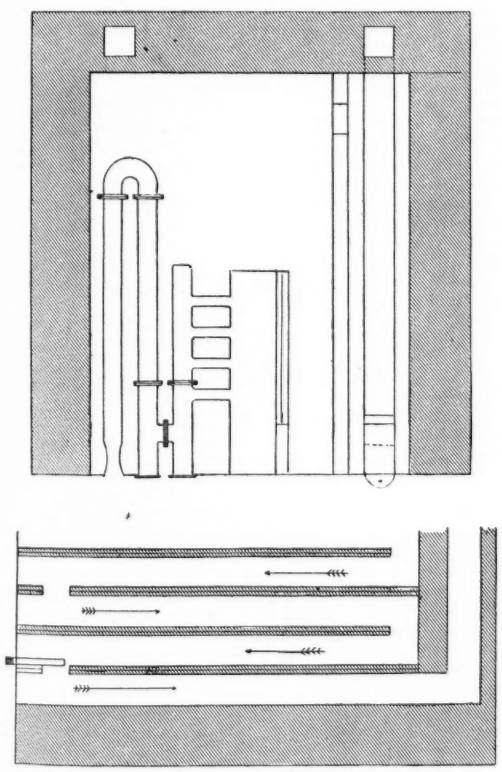


Leigel's Setting, with Sections through the Regenerator and Producer.



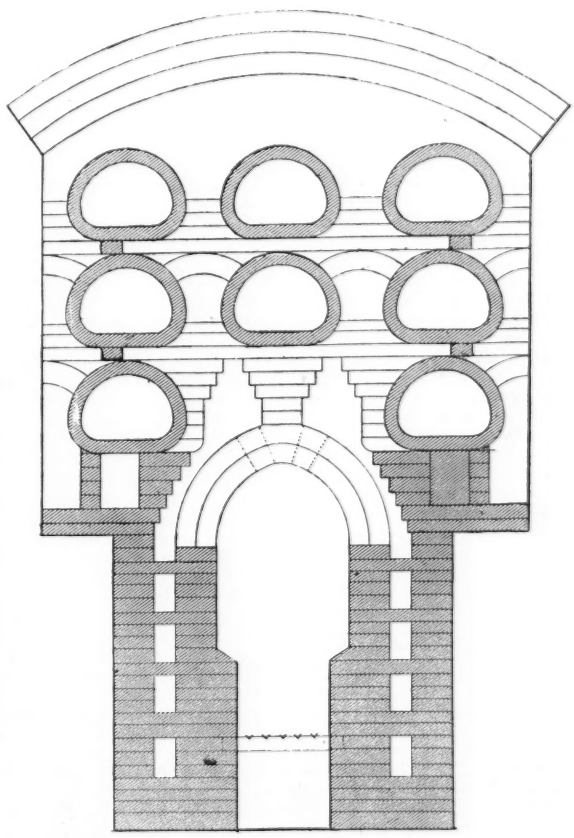


YUILL'S PATENT PRODUCER, WITH SECTION SHOWING THE WASTE-GAS FLUES.



at the opposite side of the producer. The operation of reversing is controlled by an arrangement of dampers, geared up and operated by one hand-wheel. After a period of over ten years (or about 1880), the gas industry of this country, through the instrumentality of the late Mr. G. E. Stevenson and Mr. J. West, suddenly awoke to the importance of recuperation, when they introduced the Leigel setting at Peterborough and Maidstone. This was the start of gaseous firing in this country, and very soon various forms of producers were introduced, but all adopting the same principle. Some had patent tiles, others patent producer-doors, or hundreds of patent bricks and blocks.

For the purpose of comparison, the author has prepared a few drawings of settings. First, Leigel's gas-furnace. In this design the producer is in front and independent of the setting, which form is known as the outside producer. In Germany, as far back as 1879, this producer was utilized for heating two ovens. The waste gases traverse the central flues in the groups on either side of the setting, while the smaller channels are devoted to the secondary air supply. The primary air is conducted through the lower channel. In place of the now usual grate bars, there is a 4-inch slot running the full depth of the producer, which, however, in practice, did not work well, as it was found necessary to clinker



THE QUEENSTOWN SETTING AND PRODUCER.

every twelve hours, which operation damaged the brickwork. This was possibly the only objection to the setting, the heating of which was found to be all that could be desired. The initial cost was at that time £40 per mouthpiece.

Secondly, the Hislop producer. This patent producer differs from all others in having an iron-plated bottom, and the grate bars are in sections at both sides of the producer, while the fittings are second to none. The only fault, if I may be allowed to point it out, is the enormous first cost; and this is, no doubt, a very great drawback. This setting costs about £50 per mouthpiece.

Thirdly, Mr. Alex. Yuill's setting. This you will at once grasp, owing to the simplicity of construction, and also being what you may term a general type of setting. The producer, you will notice, is directly under the setting. The air-flue is sandwiched between the waste-gas flue and the cheek of the producer. The primary air is induced by a jet of steam through a series of pipes, and delivered as usual under the grate bars; the latter in this instance being fish-bellied (cast-iron). Mr. Yuill was, I believe, the first to deal with the total elimination of clinker. This setting costs about £45 per mouthpiece, which price includes bracings with furnace fittings.

A study of these settings shows a great similarity; the only drawback to their general adoption being the excessive initial cost, which many consider is not justified by the economy realized. The author has in use a simple generator setting of six retorts, and is now putting in a setting of eight on the same principle at a cost of £8 10s. per mouthpiece, which includes producer fittings. The retorts of this setting will be corrugated, and of the same design as those used in Paris. The author, when on a visit to the Paris Gas-Works, had an opportunity of inspecting their working, and was so satisfied with their superiority over the ordinary retort that (with the permission of his Directors) he decided to adopt them.

In Paris, they are able to carbonize a charge of 9 cwt. of coal in four hours, with a yield of 11,000 cubic feet per ton of coal carbonized, as against 6 cwt. in the plain retort, which should speak for itself. The chief point about these retorts is their great conductibility and heating power—due to the reduced thickness and corrugated surface. These retorts are made of 1¾-inch thickness, as against 3 inches in ordinary retorts, which gives a reduction of about 40 per cent. in thickness. As regards their durability, some of them have been worked for twelve months with the Paris charging and drawing machines, which discharge a retort in 20 seconds.

The author intends to present to the next meeting of the Association full particulars of the practical working of these retorts.

Discussion.

The President (Mr. J. G. Tooms) said he was sure they were all very much indebted to Mr. Anderson and Mr. Dunn for their papers, and more especially to the latter, because it was, he thought, his maiden effort as a contributor to the transactions of the Association. The subject was a most interesting and important one. He thought the main argument of Mr. Dunn's paper approached the line Mr. Anderson took in his—that there was really no necessity to go in for very expensive styles of settings; and that there was such a knowledge now of the principles involved in gaseous firing, that nearly everyone qualified to be a gas manager ought to be able to design some satisfactory method of heating his retorts, without paying £50 or £60 per mouthpiece. But there was one remark which Mr. Dunn made in the early part of his paper, which he thought was a little bold, where he said that there had been "practically no improvement, in construction or results, obtained in the past 25 years." The discussion they would have might convince Mr. Dunn that there was a difference of opinion on that point at all events. Of course, he was familiar with everything which was in Mr. Anderson's paper; and there was only one remark he had to make upon it. That was with reference to the analyses of producer gas. Mr. Anderson gave the analyses of three samples of external producer gas, which were taken at the Waterford Gas-Works under ordinary working conditions; but since the paper was written—in fact, last week—they lighted up another producer (a new one). Working with only one bed, they were able to get results of 3·03 per cent. of carbonic acid, 0·27 per cent. of carbonic oxide, and 0·1 per cent. of oxygen—results approaching closely those obtained at the South Metropolitan Gas-Works.

Mr. J. Grant (Fermoy) said they were much indebted to the readers of the two papers. It gave him great pleasure, as the individual responsible for the settings at Fermoy, referred to in one of the papers, to testify to the truth of all the author claimed. His settings, which were constructed in 1896, were pulled down last year, after a life of 1200 days. He had frequently got up to 7000 cubic feet per mouthpiece out of them; and he might say that 6200, 6300, and 6400 cubic feet were common working returns—any excess beyond which would be more than his requirements. The coke sold was slightly over 9 cwt. per ton of coal; and if he could have worked the settings to their full capacity, the latter figure would have been considerably augmented. The setting was quite equal to two more seasons; but it was pulled out last year, owing to an unfortunate accident to one of the top retorts, the mouthpiece having separated from the retort. This was due, he suspected, to the use of the scurfing bar, and the mechanical wear of the rake, and of other parts which held the bolts. The setting was eminently suited to damp or water-logged foundations. At Fermoy, they had annual visitations of floods; and while he noticed the water in the ash-pans and the sole of the settings in his old house, no apparent change in the temperature of the retorts was noticeable.

Mr. J. Richmond (Kilkenny) remarked that Mr. Anderson dealt with facts; and "Facts are chiels that winna ding, and daurna be disputed." This being so, he would not have very much to say about it. Mr. Anderson was in favour of dispensing with special bricks, which, he considered, a good idea, because retort-settings could now be constructed in such a manner as to give the utmost efficiency with the ordinary patterns of bricks. He noticed in the drawings provided by Mr. Dunn that his covers and flue tilings, and such like, were checker-tiles and special bricks in many cases, whereas the observation might be made of Mr. Anderson's settings that at one place he had a false bottom of checker-work for the secondary air, but the arrangement was one of ordinary split-bricks lapping the joints, so that they make a nice tight joint. From time to time they could renew the setting somewhat, which saved a vast amount in renewals, and certainly was an advantage over using huge covers which would afterwards be put out as stuff ready for making concrete. Mr. Dunn, at the outset of his paper, stated that the results obtained from regenerative firing had not been up to the theoretical efficiency. He should like to know very much what the idea of "theoretical efficiency" was. From the analysis given in Mr. Anderson's paper, it appeared that in both producer furnaces they had from 11 to 19 per cent. of carbonic oxide. About the maximum they should have was 20 per cent.; the remainder was the nitrogen of the atmosphere. Unless they commenced not to fire their furnaces with oxygen direct, they could not expect any more theoretical efficiency. The cost of building retort-settings was a great consideration in all works, large or small; and it was somewhat startling to him to hear of a cost of about £60 being brought down to £8 10s. per mouthpiece. He was afraid that in this statement Mr. Dunn might be confusing the cost of a setting at £50 per mouthpiece, which embraced the whole bench, with the renewal of a setting without the cost of the oven. If this were the case, he would be able to remedy matters before they parted. He mentioned that in Paris, with corrugated retorts, they were getting very high results—11,000 cubic feet of gas per ton—from enormous charges of 9 cwt. But they did not get a statement as to the class of coal; and they all knew that this should be taken into consideration before they could make up a standard of comparison between one works and another as regarded make per mouthpiece, or per ton. He had heard of works in which they produced 10,000 cubic feet of gas per mouthpiece. He considered that in Ireland, if they were getting 5000 cubic feet per mouthpiece, they were doing very well. There was a great deal in knowing the class of material they were using. Mr. Dunn spoke of the extraordinary advantage of employing retorts 1¾ inches thick. It might be that with a thin retort they had a better heating surface, because they had 40 per cent. less thickness for the heat to penetrate; but, on the other hand, was not this absorbed in the charge of coal in the robbing of heat from the setting? If they had certain results from a retort 3 inches thick, and they put a heavy charge into it, there would be an absorption of heat from the retort. This absorption would certainly be drawn from the thickness of the retort; whereas, with a retort 1½ inches thick, it would be drawn from the setting otherwise. It might be that his theory was wrong; but he could see no particular advantage in having a 1¾-inch retort against a 3-inch one.

The President interposed to say that if any of the members had personal knowledge of any modern method of coal carbonization, they would be very glad to hear them.

Mr. Anderson said he thought the idea of the corrugated retort was a good one. But, in practice, the corrugations might get filled up; and his fear was that thus, in a very short time, the retort would be converted into a thinner retort of the ordinary average kind. With regard to recuperation, he mentioned in his paper that he tried that setting, and got very good results from it. But he did not repeat it; and he strongly held the opinion, along with a great many other engineers, that recuperation was not worked, because for one thing, there was so much risk of short-circuiting. There were many excellent regenerative or recuperative settings which gave splendid results the first season; but where the manager had to deal with it in a second lighting up, short-circuiting was apt to take place, and the fuel account went up enormously. Regarding the very low cost per mouthpiece which Mr. Dunn instanced—that the retorts at Queenstown cost only £8 10s.—this sum was surely not compared with the £60 mentioned elsewhere. Surely it must be that the one started from the foundations, and the other from the arches already in existence. As to the Paris retorts, he should like to know what the size of them was, and whether they were through or not, because they knew that it had been reckoned that a yield of 27,000 cubic feet per mouthpiece per day could be got.

Mr. Dunn said they were through retorts, 22 feet long, and about 15 inches in diameter.

Mr. Anderson: Then it is 27,000 cubic feet per retort, and not per mouthpiece.

Mr. R. G. Shadbolt (Grantham) said they would understand that he was supposed to be on his holiday, and had no great desire to "talk shop." There were one or two items, however, which had arisen from the day's proceedings that had somewhat

interested him; and if he mentioned them, with holiday freedom and carelessness, he was sure they would forgive any little slips. There was one thing in Mr. Anderson's paper which interested him very much—more particularly as he had had the privilege of going round the works and personally inspecting them. This was in regard to what he called the curtain across the producer. He remembered Mr. Herring's patent at the time it came out; and, personally, he should possibly have taken the line Mr. Anderson did then, and called his attention to the fact that even they in Grantham had already got the curtain across their producers, on the design of the late Mr. Chester. But the wind had been taken out of his sails a little time before, and he allowed it to pass. It was, however, astonishing to him how men's minds, in different parts of the country, ran in similar grooves, even in a little particular of this kind. He had not seen Mr. Herring's patent. That others had previously adopted the curtain wall was news to him; but in regard to himself, having some five or six years ago decided to adopt the late Mr. Chester's setting, he put a curtain wall across the producer, with the specific idea of obtaining a regular quality of producer gas, so that there should not be any variation between the producer full and the producer ready for charging. This, he thought, was the object Mr. Herring had in view. But, on showing a few of his friends, with a certain degree of pride, the arrangement of the curtain wall—giving a "curtain lecture," in fact—the late Mr. W. Carr nearly took the wind out of his sails by saying: "In my early days, at Halifax, when I first commenced experimenting with regenerative settings, I put in the same idea, only it was a little on the slope, and took the form of a shallow arch." After that, he thought it not worth his while to make any explanation in regard to Mr. Herring, because he thought it was a case of history repeating itself. This only showed how they relied on each other for their ideas, and how contagious their ideas were, and how useful Associations of this kind were. But, coming to the paper of Mr. Dunn, he must confess to a certain amount of regret that he should have left the old country to display his genius in Ireland in the way he had done. It was certainly news to him; and he could not help wondering, as he sat there, what those gentlemen who told them they were making 11 and 11½ cwt. of coke per ton for sale, with inclined retorts and regenerative settings, would have thought when they found from this paper that, for the last 25 years, no improvement had been effected in the adoption of the regenerative principle. It might be correct, and it might not. Unfortunately for the testing of the statement, some of their friends were departed. Mr. Stevenson had left; but Mr. Carpenter, Mr. West, Mr. Valon, and Mr. Hislop were still with them. It would be interesting to them, he was sure, to know that their labours for the last 25 years had been of no avail. It was somewhat startling now to learn that the Paris Gas Company continued to work on the old Siemens system in the way they originally did. There must be some reason for this; and one could not help thinking that the trend of invention since then had been in the direction of simplification of the original design, which was in the right direction, and must have effected some permanent and useful results. The progress which had been made in regenerative settings—or had not been made, rather—since the year 1880, was somewhat puzzling, because they found, looking at their own experience, and at what they saw around them, that not only had the fuel account been reduced, but the general gas yield had been increased; the working conditions had been considerably modified; and the standing charges, in spite of those high initial capital charges which they had been told of, had been considerably reduced also. These were all matters which he must, personally, think Mr. Dunn had to some extent lost sight of. Of course, when they left home on a holiday, they never knew what awaited them—what surprises were in store; and it was worth while going round the country at times, in order to pick up something which they had not heard of before. To think that they had come down from £50 and £60 per mouthpiece—and he might have added £100 in some cases—to £8 10s., was the most startling item in the whole paper. And then, with regard to those thinner retorts—the corrugated retorts—it was very curious that they had not been used more generally, if they were all that was claimed for them. He remembered a French gentleman calling upon him some two or three years ago, and pressing him very hard for an order for a retort; and he could not help thinking that if this setting was to be one of corrugated retorts, the £8 10s. would soon be swallowed up. No one had yet taken up the retort, so far as he was aware; and, personally, though he might not have the privilege of being in Ireland next year, he should look forward with very great interest to Mr. Dunn's announcement of the results of his year's working. The President had spoken of the Settle-Padfield retort. Being on holiday, he thought that he could not do better than put in a day at Exeter; and they were good enough to show him the plant on the previous Friday. All he could say was that the results which had been announced by Mr. Humphrys were practically confirmed. Two hundredweight of South Pelton slack was carefully weighed up in the way he had been accustomed to see described in the "JOURNAL OF GAS LIGHTING," and they got more than 13,000 cubic feet of gas of about 13¼-candle power per ton, calculated from one-tenth of a ton, which was the quantity of coal tested. They had upwards of 14 cwt. of coke—which appeared to be decent stuff—and other things to match. The exact figures were: Gas, 13,050 cubic feet per ton, of 13·26-candle power; coke, 14 cwt. 3 qrs. 8 lbs.; ammoniacal liquor, 17½ gallons, at 3° Twaddel, by condensation only; and tar, none. The arrangement for dealing with the tar was very ingenious. They were told that, in the first place, from 4 to 6 gallons of tar were made, according to the kind of coal which happened to be used; but they dispensed with making tar altogether, in this way: Some tar was made, but it was returned to the retort, and was simply gasified again and again until there was nothing left. This disposed of the surplus tar that was made. Compared with the ordinary working yield, they got none; and in return for that they had about 3000 cubic feet more gas, of a slightly lower illuminating power. So the question, after all, would be, Would it pay? The remarks of the President with regard to his experience with the Yeadon retort that promised well at first, were not to be overlooked. But there was a vital difference between the Yeadon retort and the Settle-Padfield. And he thought the records of the present working, having regard to his experience with the Yeadon retort, promised well. But there was a really vital difference between the Yeadon and the Settle-Padfield retort in this respect—that they could not make coke in the Yeadon that would burn, while with the Settle-Padfield they produced a coke that, so far as he could see, was really good. This was what struck him, merely from a one day's test—that the retort gave a greater range of working possibilities than any piece of carbonizing or gas-making apparatus known in the world prior to its advent. For instance, they could make coke of no real value, if they liked, because they took everything of value out of it, or they could make a good, hard furnace coke. On the other hand, they could make an 18 or 19 candle gas from the slack, if they ignored quantity; or they could go in for quantity of gas, and ignore quality. Then there was such a wide range possible in regard to working temperatures. The retort could be worked at practically any temperature. At the close of the experiment, the working conditions were, so far as he could judge, identical with those which existed when they commenced; so that they might have gone on *ad infinitum*. But the proof of the pudding was still in the eating of it; and they were now putting up a setting of six in one of their retort-houses. They had gone to a lot of trouble and expense in installing a separate plant, whereby the gas might be dealt with on a commercial scale; and when these results were published, and they were told what they did not know now of the heating value of the gas, and the fuel consumption to make it, he thought the gas public would be in a position to judge as to the usefulness, or otherwise, of this latest invention. So far as he could see, from a merely casual visit, it bade fair to rival anything which had preceded it.

Mr. H. KIRKHAM (New Ross) said he would like to say that he had had a treat that day, in listening to the description of the Settle-Padfield retort. He had been pondering over it; and there was no doubt that it was a very ingenious apparatus. He did not see why they should not have a few of these retorts put up, and have the thing tested. If they had, they could have the charge let into the retort at periodical times. The stoker would not require to go up to the top so long as it was working; the only thing he would have to do would be to draw the coke. It might look Utopian; but stranger things had happened, and he did not see why the whole performance should not be done as a matter of mechanism as to the heat or the coke. Mr. Dunn put in a few interjections which were not in the copy of his paper which he had, which he could not quite follow. At the time of Mr. Herring's patent, he intended to write to Mr. Anderson, and draw his attention to it, knowing that he (Mr. Anderson) had the same idea in his mind before the specification appeared; but he saw that Mr. Anderson had written. He thought that the size of the retorts ought to be given, and the kind of coal used. He thought that in Mr. Anderson's paper some of the results were got from retorts which were now 22 inches, and which were formerly only 14 inches. Of course, they obtained a better result from a larger retort; and he did not think there would be a great falling off in the heating of those settings.

The HON. SECRETARY (Mr. J. Whimster, of Armagh) wished to thank both Mr. Anderson and Mr. Dunn for their papers. They were on kindred topics; and he thought that it was a very good arrangement that they should be discussed simultaneously. He was struck with the point which had been mentioned two or three times—that Mr. Dunn opened his paper by saying that there had been practically no improvement in construction or results during the past 25 years, so far as regenerative furnaces were concerned; and he was thinking that perhaps Mr. Dunn was right, and that his critics were right, too. So far as the principle of regenerative furnaces was concerned, he questioned if there had been any radical improvement since they were started. But, so far as their general knowledge of them was concerned, and the getting of experience of them, there had been a vast improvement, because they all had these furnaces more or less now-a-days. Twenty-five years ago, they were a rarity; they were only beginning to be used. But the principle was there then; and he thought the results were there then, too. If he mistook not, about thirty years ago the late Mr. Foulis adopted the Siemens regenerative furnaces in putting up the Dawsholm Gas-Works, Glasgow; and they had had this system of working, backwards and forwards, the heating of flues first, and then the heating of the air through the heated flues, and so forth. Of course, that had been superseded now-a-days; but the principle was there then—the same principle which they were using to-day. In speaking of the excessive cost of a great many of the regenerative settings, he thought it was Mr. Valon

who exploded the idea that a long travel was needed in the case of the secondary air, to take up the heat. A short travel was quite as efficient, and saved great expense. This was where the economy came in, which made the system available for the smallest works in the present day. He thought they need not call Mr. Dunn in question as to the £8 10s., because, he need not say, he just meant renewing furnaces—putting in new retorts and so forth into an old bench. It was not a new installation which could be put in for £8 10s. per mouthpiece. If this could be done, they would want to know who the contractor was. Last year he took down some old benches and erected new ones—new benches, ironwork, hydraulic mains, foul mains, everything new, excavation and all—and they only came to about £50 per mouthpiece. So far as the results from these settings were concerned, he could take 7000 cubic feet per mouthpiece out of these retorts, working either four or six hours. If they worked six hours, they put in bigger charges. Sometimes they preferred to work four hours, because it seemed to lessen the trouble with stopped ascension pipes. One thing he would like to ask Mr. Anderson, with reference more to his recent remarks than to his paper. He said something about recuperation being of no advantage. What was regeneration but recuperation? Mr. Anderson seemed to heat his secondary air through his waste gases, in what he (Mr. Whimster) thought was a more expensive method than taking everything out of the waste gases after the work was done. But recuperation was simply regeneration; and he thought they were all of opinion that regeneration was a success, and an economical method of working. He knew that, as between ordinary direct-fired settings and regenerative settings, there was no comparison. They could never expect to take more than about 5000 cubic feet per ton from direct-fired settings; and they could easily enough take 7000 cubic feet from regenerative settings. There was just one remark in Mr. Anderson's paper in which he was interested—with reference to the idle settings. Mr. Anderson seemed to say that it was useless to spend money on expensive settings which were to lie idle half the year. This sounded very right, to begin with. But during the half year they were working them, they were taking a vast deal out of them; and were they not justified in going to the expense of putting up a good thing, so as to get good results during the six months the settings were working, even although they had to lie idle for another six months? During the summer six months, when they were not doing much, they could use the cheap settings. In winter, they wanted the dear ones, because they required a good yield from the retorts.

Mr. D. W. Tooms (Mallow) said he did not quite agree with Mr. Anderson as to the life of the retorts. When a retort had been lit up and let down several times, the wear and tear was so great that there must be a large loss of gas. In his opinion, the retorts could not be properly patched up. As to Mr. Dunn's paper, the 9 cwt. of coal in four hours seemed to be very excessive. He should like to know what the fuel account would be. To his mind, a thickness of 1¾ inches was far too light. If they were using a rake, he should imagine they would take off the mouthpiece in about twelve months' work.

Mr. T. Frizelle (Holywood) said generator or regenerator settings had been a debatable point since their introduction. Mr. Valon's name had been mentioned; and he thought that this gentleman had held from the beginning that generator settings were as good as regenerators. Even at the present time, this opinion was held by some. Those who had found generator settings a success had kept to them; while those who had found regenerator settings successful, of course stood by them. In Holywood they had a modified form of regenerator settings. They were peculiarly circumstanced. Their works were built practically upon the seashore, and the foundation was very bad. They were obliged to put in a concrete envelope; and he could safely say that it was not a very difficult thing to keep out water, if they went about it in the right way. He had worked settings of sixes inside the concrete envelope. The works were placed in the position that during the winter-time the tide overflowed, and the tar-barrels were floating about the yard; but their subway had been quite clear of water. A little dampness was not against a regenerative setting, so long as they could keep it under control, and not let it get up to the regenerative part of the setting. At his works he had erected, with a subway built in cement, settings for a little more than £50 per mouthpiece. He should never think of putting in a setting on his own authority, when they had specialists who had tried systems in every part of the United Kingdom, and who had made them successes. A specialist would guarantee certain results. They could waste their money by cavilling at the matter themselves—waste as much as would put in a thoroughly sound regenerative setting. During the first winter, with two settings of sixes at Holywood, they had made 90,000 cubic feet of gas. They had made 11,000 cubic feet per ton. These were results which would soon pay for any little extra cost of the settings.

Mr. G. Airth (Dundalk) said he was very pleased to see the chemical announcements made in Mr. Anderson's paper, because, though many of the members had no great chemical knowledge, they had got a smattering; and while, generally, a little knowledge might be a dangerous thing, in this case a little knowledge of chemistry merely let them know how little it was they did know, and gave them an impetus to go forward. In his works, he invariably kept a draught gauge. He could not find time to make as many tests of his gas as he would like; but he took as many as he could. He might say that he had never got results approaching Mr. Carpenter's by a long, long way, although he had sometimes got them very close to the figures given by Mr. Anderson. As to the cost of settings, he did not think it was quite fair to any maker to put his prices as against anyone else's; but he might say that he had put in settings of eight and seven, and they did not cost him £50. For the price he had paid, he got hydraulic mains, foul mains, ascension pipes, excavations, foundations, and everything else. Mr. Dunn's paper, he thought, was very good, if he had kept out the money value. Mr. Anderson's contribution was certainly written for the benefit of the Association and everyone in it, and the tone of the paper made it a very valuable one indeed.

The President said he would like to personally thank Mr. Shadbolt for his interesting description of the Settle-Padfield retort. He was sure they were all infinitely obliged to him. They had not had the privilege of seeing the plant; but they were none the less interested in it. They had had, he thought, a very interesting discussion upon the two papers. But one thing had not been touched upon, or, at least, had not been touched upon in the sense he meant—that was, the size of the retorts. There was, he thought, a size of retort which they could not economically go past. In his opinion, with a 15-inch round retort they would get as much out of the coal as they could with any form of retort—that was, taking the fuel account, the quantity of gas per ton of coal, and the quantity made per mouthpiece, into account. He had intended to open the discussion; but seeing they had a lecture and three papers to get through, he thought they had about as much as they could conveniently overtake that day. He would like to tell them about his foundations, that either last year or the year before, when they were renewing or repairing the beds during the summer, they found about 3 inches of rock salt in the bottom flues of the producer. The members would have an opportunity of testing it, if they liked, when they visited the works.

Mr. Anderson, in reply to the remarks which had been made, said he agreed that expensive settings were unnecessary, notwithstanding what Mr. Whimster had said. If they had works they were going to use for a considerable period, it was worth paying for; but it did not do to make a clean sweep of all their works and put in modern settings at great cost, which they were only going to use for a short portion of the year, because the works would be eating off their heads in interest all the time they were lying idle. He agreed with Mr. Whimster that they should put in good settings and use them for the whole twelve months, and take up the leeway with their old settings, if they were anything presentable at all. Mr. Grant talked of getting up to 7000 cubic feet of gas per mouthpiece for five mouthpieces. If the retorts had been all newly scurfed, there should be no difficulty in exceeding that. Mr. Richmond agreed with him regarding the use of special bricks. He himself used as few special bricks as he could. Possibly they would be out of a particular pattern when they wanted it; and they might spoil a good setting if they put in a brick which was not designed for that use. He raised the question of how Mr. Carpenter got 28 per cent. of carbonic oxide in his producer. There was no difficulty in obtaining it. If they employed a fair proportion of steam in the producer, they must use a much larger quantity of secondary air in consequence; so that the quantity of air to burn the coke was practically the same. Mr. Richmond did not believe in the 1¾-inch retort of Mr. Dunn. He (Mr. Anderson) joined issue with him there. He strongly believed in them; and if they could get their benches to stand them, the thinner they could make their retorts the better it would be. In future designs, it was his intention to put in thinner retorts. They could get excellent retorts on the Continent now from 1½ to 2 inches thick. By putting the division walls closer, they could be put in, and they would get greater economy from them. The robbing of the setting of heat during the early minutes of the charge was, in his opinion, a fallacy. It did not pay to store up heat in the fire-clay. Fire-clay was a very bad conductor of heat. They could not get a conductor which would stand the heat, and therefore they used fire-clay; and the thinner they had the retorts the better. He was very pleased to hear from Mr. Shadbolt what he had to say about the curtain wall. He himself claimed no originality for the invention; but, like others, he did not want to pay royalty for it. Mr. Shadbolt did not believe in the reversing system of Siemens furnaces. He was afraid that he (Mr. Anderson) did. He did not think that any regenerative setting would be a success which was worked upon the ordinary process. In his opinion, the original Siemens process was the proper one; and he was not surprised at the Paris Gas Company sticking to it. He thought it would be the design of the future to have alternating regenerators. Hitherto they had only had one oven heated from each producer, which did not give them room to have an alternating regenerator; but now they had several benches heated from one producer, and they had plenty of room at their disposal. He was inclined to think that, with the water-jacketed valves they now had, they would revert to the alternating method of heating the secondary air, and the primary air too. The short-circuiting was such an evil in the ordinary type of recuperator that he did not think it was worth having. Mr. Kirkham animadverted upon his not having mentioned the size of the retorts now and some years ago. It was true that he had increased the size of the retorts; and he could not help being struck by the fact, which seemed to him to be plain, that it did not much matter what size of retort they used, they got the same result in make. He

agreed with the President in what he said in his concluding remarks, that a 15-inch round retort was about as good a one as they could possibly get. They could charge it with a fairly good charge, on the top of which there was a space that enabled them to get the rake in and work it. It seemed to be a very fair average size. They went to the extent of 24-inch retorts with some of their settings; and he was sure they got rather inferior results as compared with the 22-inch retorts, which was the size employed in their larger settings. He favoured the 15-inch retort; and he did not know but that he might come to 14 inches with a thinner retort. He thought Mr. Whimster's remarks regarding the improvements effected during the past quarter-of-a-century, were quite true. Investigations were made into the affairs of the Paris Gas Company at stated periods; and time after time it had been reported that no improvement had been made, and that therefore there was no reason for reducing the price of gas. The principles were the same; but in the application of them a change had been made. They were now applying the principles in a much better manner than they used to do. It had been said that Mr. Valon had exploded the idea of a long travel. He (Mr. Anderson) had always felt that it was better to have a short, slow travel than a long, quick one. Give the air time to pick up the heat. If they had the air going backwards and forwards, and half of a long narrow flue became blocked with dust, the setting was ruined; but if they had a large setting, they could let the dust accumulate without its doing any injury. Therefore, instead of having a circuitous route, they put in checker-work, and had better results. He understood regeneration and recuperation to be very much the same thing. He did not think they were worth the cost; but he did think the heat ought to be taken out of the waste gases, and not sent up the chimney. Could they do this without complicating the setting and without introducing the dangers of short-circuiting? If they adopted the Siemens settings, he thought they would avoid these things, especially now, when they had so much more room available. He agreed with Mr. Tooms, of Mallow, that it was not worth while working their settings longer than they would give them proper results. If they required to lay up settings frequently, they did more harm to the retorts in one lighting up and letting down than by months of working. They could not expect the retorts to yield the same results in such a case as they would in continuous working. Mr. Frizelle said he had adopted a concrete envelope with every satisfaction. He (Mr. Anderson) believed it could be done; and if it were done properly, he had no doubt it would be a success. But for one case where it was done properly, they would find many where it was not. He did not know what the members generally experienced; but he usually found that people did not like to sink money in what they did not see. It should be put into the foundations; but it was difficult to get it done. In his opinion, it was better to put up retort-houses amply large than to go down. In most places in Ireland land was cheap, and there was less risk above ground than below. He believed in the draught gauge of which Mr. Airth had spoken, because the more they knew about their works the better they could keep them right. Sometimes they were blamed for introducing a lot of theoretical instruments; but he often found them useful. For instance, if their chimney were sheltered in any way, the draught might go down with a change of wind, and they might not know it unless they had a gauge. The rock salt which was taken out of the settings in Waterford fairly astonished him. It showed what an enormous quantity of sea water must have been evaporated. They were fifteen miles from the sea. The water was decidedly brackish, so that it was not like sea water; and to have accumulated 3 inches of salt in the settings astonished him.

Mr. DUNN, in support of his remark that there had been no improvement in construction or results in connection with regenerative furnaces, referred to the Transactions of the Gas Managers' Association of 1880. They would find there results that had not been beaten, and in a great many cases not touched yet, by Mr. G. E. Stevenson, at Peterborough. Mr. Richmond would find 1½-inch split-brick covers in the diagram of one of the settings before them. With respect to cost, there was no doubt that he made a mistake, and he thought he should take Mr. Airth's suggestion; but his own prices he was prepared to stand by. He put in benches like those shown, which cost £60—the generator, but not the furnace. Allowing £25 for the labour, it cost £8 10s. per mouthpiece, by utilizing the old bricks which came out of the setting. Perhaps the best way would be to keep out the prices altogether. At the same time, Mr. Shadbolt would have an opportunity of seeing the cost of them; and then he would be able to verify the matter at the next meeting. He considered yet that £60 was an outrageous price to pay. Only one contractor was asked to tender for their building. As to Leigel's form, in the Gas Institute "Transactions" of 1882, he believed that Mr. G. E. Stevenson put it in at 20 per cent. of coke. Had anyone beaten that?

As already intimated in the "JOURNAL," Mr. Pember, K.C., has now relinquished his practice at the Parliamentary Bar. His last appearance in the arena in which he has for so many years been a conspicuous figure was made on Wednesday. On the same day, Mr. Balfour Browne, K.C., who was supporting the case of the promoters of the North Metropolitan Electric Supply Bill before the Court of Referees, practically bade farewell to the Committee-room portion of the House of Commons.

UNACCOUNTED-FOR GAS.

By J. PATERSON, of Tipperary.

[A Paper read before the Irish Association of Gas Managers.]

In coming before you to-day with this paper, I think it wise, first of all, to beg your indulgence for the want of technical matter, such as is generally looked for at meetings of this nature. Having been very fortunate in my endeavours to reduce the leakage or unaccounted-for gas at the works over the destinies of which I have the honour to preside, from a very high to a very modest figure, it was with a sense of reluctance that I acceded to the request of our worthy President to contribute a short paper on the subject under notice.

It has often struck me as somewhat surprising, and as a very regrettable fact, that there are so many gas undertakings up and down the country losing from 10 to 15 per cent., and some even up to 20 per cent., of all the gas they make. Yet some of those who are responsible appear to be quite unconcerned, and to be perfectly satisfied with this state of affairs, and make no effort to reduce the waste. Others will tell you that their pipes are so old that they are afraid to disturb them, lest they should go from bad to worse, and besides that, they have plenty of work that demands their attention. Others again tell you that this enormous loss is a great source of worry and anxiety to them, and that they are very anxious to reduce the leakage, if possible, but that efforts in this direction are hampered by the road authority imposing restrictions on, or wholly withholding their sanction to, the opening of the roads for a systematic test, and that consequently they have to put up with this abnormal loss.

The last mentioned, of course, deserve our sympathy. At the same time I firmly believe that the undertakings so hampered form only a very small percentage of all the undertakings labouring under a heavy leakage account; and, further, that these few could be considerably reduced by judiciously approaching the road authorities, and demonstrating to them that a reduction of leakage would inevitably result in a lowering of the selling price to the community whom they represent. For the two other classes, little can be said. Those who are willing to go on in their sleepy way—losing from 15 to 20 per cent. of all their production, simply because they are able to pay a fair dividend upon their invested capital in the case of a company, or to show a surplus on each year's working in the case of a municipal undertaking, by the ready means of keeping up or raising the price to the consumer—are not at all alive to their own interests, and are doing their consumers and the gas industry generally a gross injustice.

As a very able gentleman said recently, there are two ways of making profits. There is the legitimate way, by practising economies and by good management; and there is the other method (which is only possible where there is a monopoly) of simply raising the price to the consumer. Of the two, I think the former way is by far the more commendable. If all of us were to devote a little more of our time to our distribution plant, we should, I think, be on the right road to practical economy; and this, combined with good management in manufacture, would enable us to make our profits legitimately, and not leave ourselves open to be accused of making profits by unfair methods. Most managers with whom I have come in contact seem to spare no expense to acquire the latest novelty in retort-settings reputed to be capable of extracting an extra 100 cubic feet of gas from each ton of coal carbonized, and at the same time of saving a few pounds of fuel; yet these same gentlemen are quite satisfied to continue losing from 10 to 15 per cent. of the gas they are making, and would grudge to expend a few pounds overhauling their distribution plant. It is an accepted fact that dividends are made in the retort-house; but it is equally true that ofttimes greater dividends are lost in the district. My personal experience at Tipperary has strengthened my conviction that a systematic test of mains and services, judiciously carried out, will repay the necessary expenditure in a very short time.

On being appointed to the management of the Tipperary Gas-Works in April, 1898, I found that the unaccounted-for gas was equal to 17 per cent. of the make. As there were other matters in the works requiring immediate attention, it was not till the spring of 1899 that I had an opportunity of arranging for a systematic test. The method adopted was the bladder system, which consists in isolating a section of main by means of bladders, and with a test-meter, having a large dial, testing the soundness of the section under observation. As I dare say you are acquainted with the system, I will not enter into further details in regard to it.

There are many who object to the bladder system, owing to the inconvenience caused to consumers through being temporarily deprived of their supply of gas, and the uncertainty of bladders, &c. The former, I must admit, is a strong objection; but as, by having everything in readiness beforehand, a section could be tested in from 15 to 20, and at the outside 30, minutes, I think few consumers would object to being deprived of their supply for so short a time at some reasonable hour. As for the latter objection, I fear that the vagaries of the bladders are somewhat exaggerated; and I should never hesitate to again adopt the system on this account, as, by a simple arrangement of stop-

cocks and pressure-gauges on the inlet and outlet of the test-meter, the tightness or otherwise of the bladders can be instantly detected.

As we, in small works, have many details to attend to, I was unable to devote to the testing operations so much time as I should have liked. Having only a small staff, it was necessarily a slow process; and we only managed to get through half the district during the season. But the result, so far as we had gone, was very satisfactory indeed, and was at once apparent; and when the accounts were closed for the year, there was an appreciable decrease in leakage.

The following season—viz., the spring and summer of 1900—was an exceptionally busy one for my outside staff (which at best is not a very large one). We were literally inundated with orders for gas-cookers—a very healthy state of affairs, you will no doubt say—and we were severely taxed to fulfil all the orders we had booked in the season. Thus all hope of resuming testing operations had to be abandoned until a more opportune time. However, we recommenced operations in the spring of 1901, and continued intermittently for about three months, at the end of which time we had got through practically the whole district, comprising approximately about 3½ miles of main.

We experienced considerable difficulty in locating some of the leakages, owing to the porous and gravelly nature of the soil. In most cases, however, by the aid of the steel bar, little difficulty was encountered. The net result of this systematic testing and general overhaul is shown in the following table:—

Year.	Unaccounted-for Gas. Cubic Feet.	Percentage on Make.
1897-98	1,729,000 ..	17·00
1898-99	1,485,700 ..	16·00
1899-1900	1,151,800 ..	9·40
1900-01	1,361,600 ..	9·60
1901-02	683,200 ..	5·45
1902-03	474,700 ..	3·50

Most of the leaks were traced to bad joints on mains, consequent upon hurried and defective workmanship, and in old and corroded service-pipes. During the period under notice, we renewed 46 broken and corroded service-pipes, and found about the same number of leaky joints—some small, and others very heavy leaks. In certain cases they amounted to 25 cubic feet per hour. Of fractured mains, we only found three; so it is quite apparent that, given well-laid and properly-jointed mains, our greatest source of loss was through defective services.

In order to reassure any who are reluctant to undertake a systematic test, owing to their mains being very old, I may mention the fact that some of our mains in Tipperary are upwards of fifty years old, of small diameter, and laid very shallow; yet, strange to say, these were found to be practically tight, while the greatest number of leakages were found on the more recently-laid pipes.

In undertaking the testing of gas-mains, care must be exercised not to mistake water-pipes for gas-mains, as did my men on one occasion. They did not find out their mistake until they came upon a lead water service, after having stripped about 30 yards of the water-main, which was of the same size as, and in very close proximity to, our main. The results may, otherwise, prove very disappointing.

I now come to the subject of district pressures. Until the spring of 1899, gas cookers and fires were practically an unknown quantity in our district. Consequently, the day consumption was very low; and, owing to there being little demand for gas during the hours of daylight, the maximum day pressure in the district was only 7-10ths, the maximum night pressure being 18-10ths. This has all been changed now. We have upwards of 200 cookers and fires, four gas-engines, and all manner of appliances wrought and manipulated by gas, in constant use during the day, which necessitates a day pressure of not less than 15-10ths to 16-10ths. Owing to the almost general adoption of incandescent burners for both public and private lighting, we have to maintain a pressure of from 25-10ths to 30-10ths in order to ensure satisfaction.

It is probably unnecessary for me to mention the fact that, luckily (or perhaps unluckily), I am not troubled with subsidences of the ground due to coal workings, &c., injuring my mains, as are some of our more unfortunate brethren across the water. Neither have I been troubled by the ravages of the steam road-roller. Otherwise, matters would very likely be different, as all our mains are laid in the roadway—some being not more than 10 to 12 inches below the surface.

I may say that I am somewhat fortunate in having a very obliging and tolerant road authority to deal with, considering we are a non-statutory Company. They have never objected to our opening the roads, for whatever purpose we have found it necessary to do so, but have at all times offered us every facility to put our distributing plant in order—a fact which is much appreciated by my Directors and myself.

While keeping a keen eye upon, and devoting a fair portion of my time to, the distributing department, I have not done so to the neglect of the manufacturing and purifying departments. Up till 1899, the average yield of gas per ton of coal carbonized was about 9600 cubic feet. During the past two years, it has averaged well over 10,000 cubic feet. The coke sold per ton of coal carbonized has been constantly on the increase, and for the year ending the 1st of May last, I sold 9½ cwt. per ton. Last year we erected two new purifiers 10 ft. by 10 ft. by 4 ft. 6 in.; the whole of the work being done by my own staff. These are charged with oxide, and the old boxes, which are only 6 ft. by 6 ft. by 4 ft., are used as limers. This has enabled us to supply gas of greater purity, and at the same time reduce the cost of purification by about one-half.

Old and defective meters are, I feel satisfied, to a great extent responsible for a fair percentage of unaccounted-for gas. Gas-meters are, after all, mere mechanical appliances, and liable to go wrong at any time; yet how many gas companies or corporations make it a rule to test their meters periodically? In Tipperary, we test every meter whenever it has attained its tenth year, and the gas saved by so doing more than warrants the expense incurred in the removal and testing.

In concluding this brief paper, I hope I may have aroused the curiosity of any who are labouring under the weight of a heavy leakage account, such as I was myself a few years ago. I would assure them that they have a remedy at hand, if they will only grasp it.

Discussion.

The PRESIDENT (Mr. J. G. Tooms) was sure that the members would agree with him that Mr. Paterson was to be congratulated on having brought his leakage down from 17 to 3·5 per cent. In what might be considered a small works in Ireland, with certainly less than the average number of consumers per mile of main that existed in England, not only had he brought it down in the percentage, but if they took the figures in the aggregate, there was a loss of 1,729,000 cubic feet in 1888, and last year that figure was lowered to 474,700 cubic feet. They were all aware that the percentage of leakage could be reduced by increased consumption; but Mr. Paterson's was not a case of this sort. There there was a reduction to one-fourth the quantity. He thought that this should spur on a good many managers to look at the question of leakage. As Mr. Paterson had remarked, certain managers went in for some little fad, to the neglect of other work which might more properly engage their attention. Speaking of leakage, they had nothing very great to boast about in Waterford. Their leakage was 8 or 9 per cent.; but they were on the down-grade. They reduced their leakage this year by 3 per cent.; and considering that the Waterford Corporation had just completed a sewerage scheme, which embraced almost every street in the city, he ventured to think a reduction of 3 per cent. of leakage was something to be proud of. When the Corporation started their scheme, he expected they were going to do the Gas Company a good deal of harm and damage; and the Company appointed a man (for part of the time, at all events) who was constantly watching the work. He considered that this had been money well spent. In fact, now that their year's accounts were closed, they showed that this was so; and it was due to the fact that during the work a good many services and connections were laid bare and examined, which required renewal. He was greatly obliged to the author for reading the paper. He was aware of Mr. Paterson's results; and it was at his request that he agreed to come to the meeting and give his experiences. Of course, he had had excellent material to work upon, because he was in the position of selling 9350 cubic feet of gas per ton of coal, and of having only 3·5 per cent. of leakage.

Mr. J. GRANT (Fermoy) also congratulated Mr. Paterson on the excellent results he had obtained.

Mr. T. FRIZELLE (Holywood) said the subject was one that was present with them all. There were, he thought, some factors at work which Mr. Paterson had not taken account of. These were the temperature, the pressure, and the aqueous vapour. If they measured 1000 cubic feet of gas at normal temperature, 60°, and it passed through the town and through the consumers' meters, in the winter time, at 32°, they would have only about 940 cubic feet for sale, or a loss of about 60 feet. Also, if the barometer stood at 30, and it dropped to 29, they would have lost about 40 cubic feet. Then, as to aqueous vapour, the higher the temperature the more of it the gas carried; and it was to be found in the drip-boxes and at the inlet to the gasholders. Suppose gas passed out of the scrubbers at 60°—and it was not safe to be lower than that, otherwise it was at the expense of the illuminating power—it rose in the purifiers perhaps 10° or 15°. It then passed through the station meter, and was registered. Before it got into the gasholder, they had it condensed, because it could not be all surface water they pumped out of the inlet and outlet of the gasholder. If they took this water, and converted a cubic foot of it, containing about 6¼ gallons, into steam, they had 1028 cubic feet. This represented 1028 cubic feet which had been registered by the station meter, and which never got to the consumers' meters. This was unaccounted-for gas, and bulked largely with some of them in their leakage.

Mr. J. BRADLEY (Athlone) said that in 1902 his Council called upon him to make monthly statements of the gas sold and the unaccounted-for gas. This was the first time it had been done, as previously the statement had been a yearly one. In January, 1902, the unaccounted-for gas was as low as 5 per cent. But it gradually went up as the days lengthened, until it reached the abnormal amount, in June, of 39 per cent. The month happened to be exceptionally warm. It was his first experience in a matter of this kind. Various theories cropped up in his mind to account for it. One of these was condensation, owing to the exceptionally warm weather. However, he was called upon to give an explanation or to resign. This brought things to a crisis;

and, pending the time for his explanation of the matter, the Town Clerk was instructed to endeavour to get the experiences of older and wiser men than he was. Among the other theories he advanced, in addition to the state of the weather, was that it was on account of the want of consumption during the summer months. He suggested the getting of an experienced man to test their plant. The Dublin Gas Company sent down a man, whose test did not at all agree with the enormous amount of gas they had lost in June. They had no gas-engines and no cooking-stoves, in any case, in June of that year. In June of this year, they had a few cookers working; and the leakage was down to 18 per cent. In the meantime, there had been nothing done by anyone. He had no doubt the actual loss, as well as the percentage, was brought down. In July of this year, the loss was 21 per cent. He might say that the station meter was tested twice.

Mr. F. EUSTACE (Tullamore) asked Mr. Paterson if his day pressure at the present time was 15-10ths, and what was the largest sized main he used.

Mr. PATERSON said his pressure was 16-10ths, and his main 6 inches.

Mr. R. G. SHADBOLT (Grantham) thought it would be interesting to know what the monthly amounts were, because he had been looking at this question a little. Considering the extremely great day consumption, and more especially the Sunday consumption, they found it necessary to raise the pressure at certain times. Making the pressure 2½ inches, instead of 1½ inches, they found had a great effect on the leakage; but if they put it on at the exact hours at which the pressure was required—and therein lay the *crux* of the whole question—there was a great difference in the leakage. If Mr. Bradley could give them the figures of his total leakage for a whole month, they would probably find it did not vary much from month to month. If that were so, it must be confined to the mains and services.

The PRESIDENT said it occurred to him that perhaps the explanation of Mr. Bradley's difficulty might be that it was only when the station meter was working at its maximum that it registered correctly. It would only work at its maximum in mid-winter; and as the quantity of gas eased off, it might register more than it ought to. He did not think they could place much reliance upon the testing of the meter, unless they knew how it was tested. He once knew of a meter which was all wrong, although it had been tested and certified to be correct.

Mr. EUSTACE said his unaccounted-for gas was between 10 and 11 per cent. He put in a new governor, and during the months of June and July, while it was being erected, he connected the inlet of the governor with the outlet. At the end of the two months, the unaccounted-for gas was as high as 20 per cent., which was an increase of 10 per cent. This increase, he believed, was due to the governor not being in action. He thought that unaccounted-for gas was largely due to pressure and to the employment of too small mains. In his opinion, pressure accounted for at least 6 per cent.

Mr. J. RICHMOND (Kilkenny) asked Mr. Paterson how he was able to arrive at the quantity of gas sold. Suppose there were 200 public lamps, and he was assuming that they were burning double the quantity of gas they were, he could not tell the quantity of gas consumed.

Mr. ANDERSON would like to emphasize the monetary saving which had been effected by Mr. Paterson. He reckoned it at about £130 per annum for all futurity, which showed how profitable it was to pay attention to this subject.

Mr. PATERSON said that Mr. Frizelle had attributed leakage to the difference in temperature at the station meter and consumers' meters. He did not think he had any advantage at Tipperary over any other place, but the temperature in his governor and meter house was practically the same as at the consumers' meters. His governor and meter house was practically an open shed, so that the temperature of the meter and of the gas while being measured was almost atmospheric temperature. He did not therefore think it was owing to this that his leakage was so low. It was not only the percentage which was low, but the actual quantity lost and the actual quantity sold. Last year he sold between 9600 and 9700 cubic feet of gas per ton of coal, so that there could not have been a great deal of condensation. Mr. Eustace put it down to having to maintain high pressure in small mains. Could he tell him what his annual consumption was?

Mr. EUSTACE: 5 million cubic feet; the main is 5 inches.

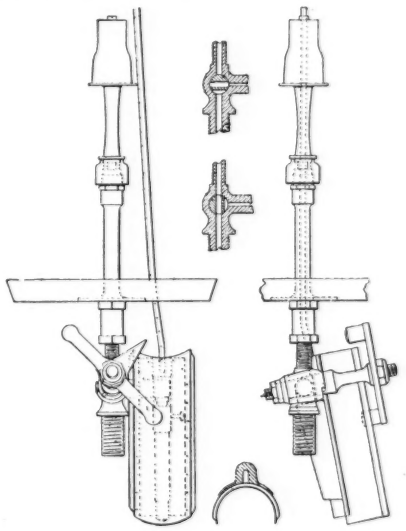
Mr. PATERSON said his annual consumption was bordering on 14 million cubic feet, and his leading main was only 6 inches; so that Mr. Eustace had the advantage over him. He had to maintain 15-10ths to 16-10ths during the day, and 25-10ths to 30-10ths during the night. Their street-lamps were almost all fitted with Welsbach Kern burners; and he considered, in looking up his accounts, that they consumed 3 cubic feet per hour. He took that to be the average consumption; and as he had only 70 lamps, even if he were to be out a foot or so per lamp per hour, it would not be very much for the whole year. He thanked them for the way in which they had received his paper.

The Gas Committee of the Glasgow Corporation have resolved to advertise for an Engineer and General Manager to fill the vacancy caused by the death of Mr. W. Foulis. The salary to be offered is from £1000 to £1200 a year. Mr. Foulis's salary was latterly £1400 a year.

REGISTER OF PATENTS.

Gas-Lamp Lighters.—Podmore, A. E., and Thomas, J., of Hatton Garden, E.C. No. 18,051; Aug. 16, 1902.

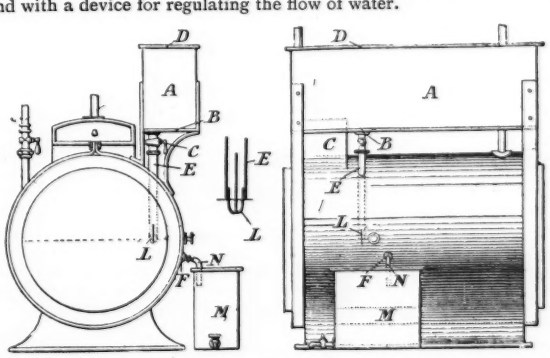
Front and side elevations, and details of the plug, of this lighter are shown. The burner is mounted as usual in the lantern, below which is fixed a gas-chamber made somewhat in the form of a half-cylinder—that is to say, it consists of two curved sides joined together so as to be approximately of the form of a crescent or half-circle in section, leaving a space between, with a top and bottom of like shape, so as to form a box. The inside wall of this box or half-cylinder is perforated with small holes to serve as a number of burners, so as to be easily ignited by a lamp-torch when introduced between the horns of the crescent. The gas-chamber is placed close to the cock which controls the supply of gas to the lighter; and the burner and chamber are in communication with the casing of the cock by means of a branch pipe. The cock may be of any construction which permits a second passage in addition to the main way. The upper end of the gas-chamber is provided with a small pipe fixed more or less vertically and extending to near the top of the burner. This pipe is also furnished with a number of small holes from the bottom to the top.



When the lampman inserts his torch into, and parallel with, the concave side of the gas-chamber, he pushes up the lever of the plug; and when the latter has revolved a certain distance, communication is established between the gas supply and the branch pipe, admitting gas thereto, and thence to the gas-chamber, whence it issues by the perforations and becomes ignited by the flame in the torch. As the plug is revolved, the gas also passes through the main way to the chief burner. The flame travels from the wall of the gas-chamber up the small pipe by means of the jets from the perforations in the pipe becoming ignited; and finally the flame issuing from the upper open end of the small pipe ignites the burner, and as the lampman continues to revolve the plug of the cock by pushing the torch upwards, he shuts off the gas supply to the igniter, and fully opens the way to the main burner.

Gas-Meters.—Lacroix, E., of Chalons-sur-Marne, France. No. 20,319; Sept. 17, 1902.

The object of this invention is "to ensure an absolutely constant water level" in gas-meters, and thus "obtain perfectly accurate readings." This result is obtained by the addition of an upper reservoir or tank communicating with the casing of the meter by means of a tube, which extends to the normal water level, and is provided at its lower end with a device for regulating the flow of water.



The inventor says that the principal improvement consists in adding to the ordinary meter a reservoir A filled with water and hermetically closed. From B a pipe E leads downwards into the casing of the meter, and extends to the normal water level. C is a stop-cock at or near the intersection of the reservoir and pipe. D is the cover of the reservoir. When the lower end of the pipe E is immersed, no flow of

water takes place from the reservoir, since no atmospheric pressure is exerted on the water level in the latter. When, however, the water level falls, the lower orifice of the pipe is uncovered, air enters the reservoir, and water flows from the latter until the lower orifice of the pipe is again immersed. By this means, the level is "theoretically rendered stationary at the lower orifice of the tube." But in practice, this is not the case; since when the level falls, there is formed at the base of the pipe E a globule or meniscus which closes the orifice long after the water level has fallen below the latter, and when the globule falls or breaks, water is precipitated and raises the level until the end of the pipe is immersed. The "variation of level consequently amounts to several millimetres, and the desired object is not obtained."

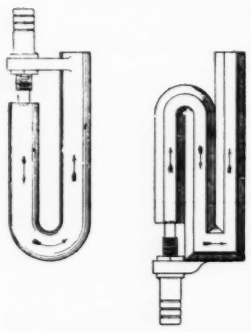
To remove this important disadvantage, the inventor proposes to provide the end of the pipe E with an interior metal wire device or the like L, which extends several millimetres beyond the end of the pipe. The object of this device is to prevent the formation of the globule referred to above, or at least to cause the immediate breaking of it, "so that the level is kept absolutely invariable at the height determined by the lower end of the pipe E."

Further improvements are for the object of preventing the obstruction of the syphon and the resulting interception in the passage of the gas. It sometimes occurs, in effect, that the gas pressure produces a kind of ebullition in the water of the meter, which ebullition fills the syphon, intercepts the passage of gas, and the burners are extinguished. To remove this disadvantage, an empty receptacle M may be placed below the emptying point F of the syphon, which is provided with a tube N for the overflow, so that all interception in the passage of gas is prevented.

Bunsen or Atmospheric Gas-Burners for Heating Purposes.—Fletcher, Russell, and Co., Limited, and Thomas and William Fletcher, of Warrington. No. 10,364; May 7, 1903.

The object of this invention is to construct a bunsen or atmospheric gas-burner with an open tube, without gauze, air slide, or other protection, so as to admit of the flame being turned up or down to any extent without explosion or lighting at the jet.

The burner admits of being made in two forms—one wherein the gas-jet is inverted and projects the gas (and with it the air) downwards into the open mouth of a tube, which is in a vertical position and forms the first mixing-chamber for the gas and air. This tube is carried down in approximately a vertical position for a certain distance, and then bent up again on itself vertically like an inverted syphon, and the mixture of gas and air is ignited at the upper end. This arrangement, although more economical and simpler in construction than the second arrangement, requires (say the patentees) the gas-inlet to be placed much higher and nearer to the flame, and is consequently only advisable to be used in cases where the tubes can be placed at a sufficient distance apart.



In the second form, the gas-jet is turned upwards below the open mouth of the vertical mixing-tube. This tube is carried first upwards, then bent downwards, and finally bent upwards again in a serpentine form; the mixture of air and gas being ignited at the top of the second bend. According to this arrangement, the gas-jet, being placed at a greater distance from the point of ignition of the mixture, renders it more suitable for application in cases where the burner tubes are placed near together, as there is less liability of the gas becoming lighted at the jet.

Gas-Burners and Purifiers for Use therewith.—Le Croix, X. de, of Brussels. No. 10,551; May 8, 1903.

This invention (relating more particularly to acetylene burners and purifiers) comprises a chamber inserted between the burner nozzle and the gas-pipe cock in such manner that each burner or nozzle is supported by its purifier from which it receives purified gas. The purifier does away with numerous drawbacks due to incomplete purification of gas before it is burned, and prevents the formation of solid and liquid hydrocarbons, which become carbonized and soon clog the burner orifices "whereby the flame is rendered dim and smoky and unsteady." The purifier is of small size, so that it can be screwed to the cock of a burner-pipe and receive a burner tip to which it serves as a support. The purifying and drying substance is arranged in any suitable manner, so that the gas, immediately before combustion, is freed from any impurities that it may have carried away with it into the pipes.

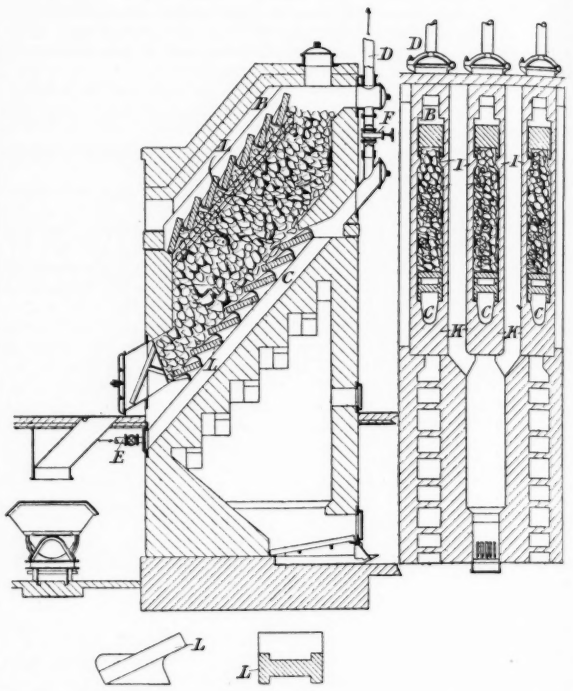
Controlling the Supply of Gas to Burners.—Liddle, E., of Stockton-on-Tees, and Druiff, G. E., of Hatton Garden, E.C. No. 13,342; June 15, 1903.

This invention has reference more particularly to incandescent gas-burners in which a bye-pass is used; and its chief object is to provide means for controlling the supply of gas to the burner from various parts of a room or building, while at the same time also controlling and interchanging the bye-pass and self-igniter, where one is used.

Gas-Retorts.—Horn, G., of Braunschweig, Germany. No. 13,648; June 18, 1903.

The illustration shows apparatus constructed according to this invention—transverse and longitudinal sections of the whole arrangement and of the plates forming the wall between the channels (hereafter referred to) and the retorts.

A number of retorts are heated by the same furnace, and are each provided with two channels, B and C—one at the top and the other at the bottom. Both channels communicate with a gas outlet-pipe D. The top and the bottom of the retorts, together with their channels, incline upwards; but either or both may be horizontal. The top and bottom of the retorts are composed of plates L resting upon shoulders I or K on the inside of the retort. They are provided with ribs; so that while, on the one hand, they mutually support each other, on the other hand free spaces are left between them through which the gas generated passes. The shape of the plates must be such that, while resting as securely as possible and inclined towards the retort mouth,



the space between the plates allows the gas generated to pass freely away into the channels; and the shape must also be such that the charge (ash or the like) cannot fall through the spaces into the bottom channel.

The bottom channel may advantageously be used, says the patentee, to pass steam or the like through the layer of coke, and thus decompose it. For this purpose, the steam is led into the lower end of the channel C, through a connecting pipe E. At the top end of the channel, communication with the channel B is cut off by the damper F. Steam passing in through E is then compelled to divide up in its passage through the channel C and flow equally throughout the layer of coke. In consequence of its being thus divided up, the mass of coke is not cooled to so great an extent as usual, when the whole of it passes through the layer of coke at the same time.

APPLICATIONS FOR LETTERS PATENT.

16,940.—Edwards, E., "Gas or oil engines." Aug. 4.

16,966.—Gielis, H., "Blowing off the air from gas-purifiers." Aug. 4.

17,050.—Cox, J., "Gas lighting by incandescence." Aug. 5.

17,055.—Akester, W. H., "Rods for incandescent gas-mantles." Aug. 5.

17,056.—Akester, W. H., "Atmospheric burners for incandescent gas lighting." Aug. 5.

17,091.—Henshaw, C. T. A., "Gas-tap for inverted incandescent gas-burners." Aug. 6.

17,138.—Newbury, S., and Phillips, W. T. & A., "Washers." Aug. 6.

17,196.—Sansom, H. W., "Tap or valve for water or other fluids." Aug. 7.

17,197.—Wheaton, C. R., "Gas heating-stoves." Aug. 7.

17,204.—Thompson, W. P., "Manufacture of strengthened pipes." A communication from Aimé Bonna. Aug. 7.

17,215.—Westinghouse, G., "Apparatus for the manufacture of gas." A communication from A. M. Gow. Aug. 7.

17,234.—Perkins, J. E., and Kelsall, T., "Gas-lamps." Aug. 8.

17,266.—Schulze, E., and Chemische Fabrik Ladenburg G. m. b. H., "Process for the separation of the phenols of coal tar from the neutral constituents of the latter." Aug. 8.

Gas Preferred to Electricity at Limerick.—At the meeting of the Limerick Harbour Board on Monday last week, a report was read from the Engineer (Mr. Mooney) in reference to the cost of lighting the docks, quays, and north side quays. He said the plant, &c. would cost £561 15s., and the estimated annual cost of lighting by electricity would be £719 16s. 9d. The present cost of lighting by gas, including the two electric lights at the dock gates, was £323 8s. 2d. per year. The Chairman (Mr. Goodbody) said the Board would "stick to gas."

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Fiscal Question and Gas-Works Plant.

SIR,—No one who knows Mr. H. A. Willey can possibly believe him to be actuated by any but well-meaning motives, and he is credited with taking a real interest in the welfare of his workmen. Although, therefore, his recent utterance, as reported in this week's "JOURNAL," breathes the very spirit of those good old Protectionist days when, it is said, tenants were driven to the poll like flocks of sheep, to vote for their landlords, it need hardly be taken very seriously. But it may be as well for him to ask himself how he would like the weapon which he purposes to use, to be turned against himself. If he refuses to employ Freetraders who object to have their food taxed, how could he complain if Freetraders refused to employ him, who so evidently desires that they shall be obliged, by the shutting out of foreign competition, to pay more for the articles they require. Retaliation, of which so much has lately been heard, is, after all, a game at which more than one can play.

My principal object, however, in addressing you is to call attention to the new danger with which the gas industry is threatened by Mr. Willey and his Protectionist friends. While efforts are being made to free the industry from restrictions which we believe to be impeding its progress, they are intent upon forging for it new fetters, which cannot but prove onerous in permanently raising the prices of materials, &c., that are necessary for carrying it on. This is surely a matter that deserves serious attention. I know it is said that Protection would encourage home industries, and so benefit the nation; but that such benefit, if it should follow at all, is likely to be permanent, I cannot bring myself to believe. Speaking, not as a manufacturer, but as a humble consumer, the system appeals to me as one for the benefit of the few at the expense of the many, and as such I, for one, am unable to agree with it.

15, *Victoria Street, S.W., Aug.* 14, 1903. CHARLES HUNT.

Sulphur Purification.

SIR,—I have read, with great interest, Mr. H. E. Jones's comments on my article on the above subject, and my description of his process as used at the Commercial Gas Company's works. I know that Mr. Jones has comparatively recently preferred a rotation of five vessels for total purification, in place of his original process; but I am still in favour of the older method, of which I had such long experience, although it must be admitted that the sulphide vessels threw an undue amount of back-pressure. This difficulty could surely be met by a larger area in proportion to the velocity of the gas. In suggesting this, however, the increase of capital expenditure might be an impediment of which such a competent Engineer as Mr. Jones is a better judge than I am.

The question of sulphide vessels being a danger, as "magazines of sulphur," is surely not really alarming, with an efficient plant. A so-called dangerous material is, in reality, quite safe to store under proper conditions.

Some sulphur disturbances in the use of sulphide vessels recalled by Mr. Jones are well within my recollection, and the fact of the failures being traced to leaky valves. If I remember rightly, the substitution of water-valves prevented a recurrence of the mischief.

With regard to the difficulty of the sulphuretted hydrogen, to which Mr. Jones alludes, I do not remember that it was considered essential that the gas should be absolutely free from it on entering the sulphide vessels; and the small quantity of it on the outlet of the sulphides was dealt with in the usual way, by a check-vessel. The elimination of sulphuretted hydrogen from gas to such an extent that an unduly severe test will not detect it has always been a difficulty; and I agree with Mr. Jones that this is especially the case with water gas. The hydrocarbons in carburetted water gas seem to have some special power of partially paralyzing the completeness of the action of the ordinary purifying materials. The effect is, no doubt, due to the condensation of oily products on the particles of the material, causing an interference with the usual energy of contact action.

Aug. 13, 1903. H. LEICESTER GREVILLE.

The Gas-Engine as a Pumping Medium.

SIR,—I much regret that an unavoidable engagement prevented my being present at the discussion on my paper, on "The Internal Combustion Engine as a Pumping Medium," at the meeting of the British Association of Water-Works Engineers at Bolton on the 23rd ult. (*ante*, p. 307). Assuming that silence may be taken as acquiescence, it is gratifying to find that the discussion raised was but small.

Referring to the points mentioned by Mr. Preston, of Grantham, I do not consider that I have under-estimated the consumption of gas in a good modern engine. I have consulted the lists of the leading makers, and, though some of them guarantee a lower figure, I look upon 15 cubic feet per brake horse power per hour as a fair average. Of course, as Mr. Isaac Carr pointed out, everything depends upon the calorific value of the gas; and my figure was based on the assumption that it was of from 650 to 700 British thermal units. With a lower quality, the consumption per brake horse power would be proportionately higher. The age and type of the engine would also have a material bearing on the case, as naturally the earlier types are not so economical as those of present-day manufacture. Again, Mr. Preston does not say what was the price of the oil, per gallon, with which he tested his engine, when he obtained a much lower result than the figure I mentioned. My calculation was, as stated, based on oil at 6d. per gallon.

It is true that, so far, no very large deep-well pumping plants driven by gas-engines have been put down; but the Madeley plant is a very considerable step in advance of anything previously done in this country, and leads one to be sanguine and hopeful as to the future.

It seems to me that the cost of the "dynamic" gas, mentioned by Mr. G. Hodson, was very high. Many well known producer-gas plants make gas at 2½d. per 1000 cubic feet, including all standing charges, interest, depreciation, &c.; and though four times as much of it is required to produce an equal result with coal gas, the cost of working only amounts to 10d., as against 2s. 6d., per 1000 cubic feet, the average price of coal gas.

If steam-engines had been used at Madeley, it is very doubtful whether the consumption, even with the higher class of engine, would have been brought down below 3 lbs. per brake horse power; so that by employing a gas plant only one-third of the quantity of coal is used—thus effecting a considerable saving in cartage alone, which, in this case, is an important item, as the works are some miles from a railway station, and in a very hilly country.

Openshaw, Manchester, Aug. 10, 1903. D. HASTINGS IRWIN.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

During the past week, the following Bills received the Royal Assent, and the session closed on Friday: Bath Corporation Water Bill, Birmingham Corporation Bill, Bournemouth Gas and Water Bill, Bradford Corporation Bill, Bury and District Joint Water Board Bill, Chard Corporation Gas and Electricity Bill, Derby Gas Bill, Ebbw Vale Water and Improvement Bill, Gas Orders Confirmation Bills (Nos. 1 and 2), Gas and Water Orders Confirmation Bill, Irvine and District Water Board Order Confirmation Bill, North-Western Electricity and Power Gas Bill, Sheffield Corporation Bill, Walker and Wallsend Union Gas Bill, Water Orders Confirmation Bill.

LEGAL INTELLIGENCE.

Sheep Washing in Streams Feeding Water-Works.

In the Chancery Division of the High Court of Justice on the 8th inst., Mr. Justice Byrne had again before him the action brought by the Mayor and Corporation of Bradford against a person named Walker, reported in the "JOURNAL" for the 14th ult. (p. 119). The plaintiffs had obtained an interim injunction against the defendant and his son, farmers, restraining them from washing sheep or other animals in the stream known as the Blayshaw Gill, at Stairbeck, in the West Riding. The defendant did not appear, and the injunction went by default; but his Lordship directed that a statement of claim should be prepared in accordance with the Water-Works Clauses Act, 1847. Mr. Levett, K.C., told his Lordship that this had been done, and he asked for judgment in the form settled by his Lordship. This was granted, with costs.

Unfounded Charge of Stealing Gas-Pipes.

At the Norwich Police Court, on the 7th inst., before Messrs. E. J. Caley and H. Z. T. Flowers, Joseph Tilley, labourer, was charged with stealing 11 feet of ⅜-inch and 36 feet ½-inch compo. piping, 8 feet of 3-inch and 6 feet of ½-inch brass tube, eight ½-inch bends, and a number of elbows, nipples, caps, &c., to the total value of 15s. 10d., the property of the British Gaslight Company, between the 1st of January and the 1st of April. Mr. E. Reeve prosecuted, and called the following witnesses. Mr. H. Waite, the Company's District Superintendent, stated that the prisoner was in their service as a fitter's labourer until last April, when he was discharged. Detective-sergeant Goldsmith showed him the various articles mentioned in the charge, and these were exactly similar to those issued to the men. When anything was taken from the works by the fitters, the issue was booked to them; and in January witness gave orders that any fitter having property belonging to the Company was to return it, and not to keep any stores in his house. Walter Joseph Paston, a fitter in the employ of the Company, said prisoner was his labourer until the beginning of April. The various articles produced would be of the character of some he had told prisoner he might take home; but he would have no right to keep them for more than a night—certainly not for four months. Prisoner asked witness if he thought he had any intention of stealing the property; and he replied that he did not. In answer to Mr. Reeve, he admitted that if he had been discharged he did not know that he should have taken things back that he had in his possession. At the same time, he should have told someone about them. The detective having given evidence as to finding the property in the house of the prisoner's father, and charging Tilley with stealing it, Mr. Reeve said this was the case for the prosecution. The Chairman (Mr. Caley) said the Bench did not consider the accused had any felonious intent, and there was no evidence that he meant to convert the articles to his own use. They could not overlook the fact that he did not receive the supervision he ought to have had from the fitter, who should have seen that the goods were returned. The accused had placed himself in a very awkward position; but the Bench would give him the benefit accruing from the negligence shown. They hoped that his appearance on the charge would prove a serious lesson to him for the future, and that he would learn to discriminate between what was his own property and that which belonged to other people. He would now be discharged. On the application of Mr. Reeve, the pipes, &c., were ordered to be given up to the Company.

The Huddersfield Corporation and Compensation Water.

In the Court of Appeal on Tuesday, before the Master of the Rolls and Lord Justice Cozens-Hardy, actions brought by the Meltham Spinning Company, Limited, and the Bent Ley Silk Mills Company, Limited, against the Huddersfield Corporation were heard, on the appeal of the Corporation from a decision of Mr. Justice Wright. The matter arose out proceedings taken against the Corporation in respect of the payment of penalties for a breach of the provisions of the Corporation Water Act of 1869. The Act provides that the Corporation shall cause to flow from a reservoir to be constructed at or near Blackmoor Foot into the Brow Grains Dike, near New Bridge Mill, 981 gallons of water per minute between 6 a.m. and 6 p.m. during every "lawful working day." If the Corporation do not maintain this quantity, they may be sued for a penalty of £5 a day by the millowners affected, and, in addition, are liable for any damage or loss sustained by the owners—the proceedings to be taken "in any Court of competent jurisdiction." The plaintiffs, in a pending action, claimed penalties for 156 days, alleging that the defendants had, for six months before the issue of the writ in February, 1902, been guilty of neglect regarding the provision of compensation water. The plaintiffs wished to have the action tried at Leeds. The question for immediate decision was whether the penalties were to be recovered summarily, or by action in the High Court. Mr. Justice Wright held that they could be recovered by action; and from this decision the Corporation appealed. Mr. Danckwerts, K.C., Mr. Harper, and Mr. Bayliss Williams appeared for the appellants; Mr. Scott Fox, K.C., and Mr. Redman represented the millowners. Mr. Danckwerts submitted that the penalties could only be recovered summarily before Justices, and that summary proceedings were the proper remedy under the Act. Mr. Scott Fox contended that the order of Mr. Justice Wright was correct. The question was determined by the former case of *Beaumont v. Huddersfield Corporation*. The claim was really for compensation; the shortage of water being a most serious thing to the millowners. In the result, their Lordships affirmed the decision of Mr. Justice Wright, and dismissed the appeal, with costs.

The Liability for Forged Transfers.

The important action instituted by the Corporation of Sheffield against Messrs. Barclay, Bevan, and Co., in connection with the above subject, to which reference has been made on several occasions in the "JOURNAL," was before the Court of Appeal, composed of Lords Justices Vaughan Williams, Romer, and Stirling, just before the rising of the Courts for the Long Vacation. The circumstances were as follows: In March, 1893, one Sutcliff, who had been the trustee of an estate, retired. Messrs. A. A. Timbrell and A. O. Honnywill were appointed as new trustees, and £8500 of 3½ per cent. irredeemable stock of the Corporation, belonging to the trust estate, was transferred into their names. Timbrell shortly afterwards instructed a firm of stockbrokers to sell £8200 worth of stock, on the trustees' behalf; and on April 10, 1893, it was sold to a firm of stockjobbers, who asked the brokers to procure them a loan on the security of the stock, to enable them to pay the vendors. The money was borrowed from the defendants, and a deed of transfer was prepared in favour of Mr. E. E. Barclay, as the representative of the bank. This deed was sent to Timbrell, and was returned by him, apparently duly executed; and the transfer was lodged with the bank. The stock was registered by the Corporation in the name of Mr. Barclay, and the new certificate was received by the bank. In the meantime, the jobbers had sold £8000 of the stock, which was transferred to the purchasers. The remaining £200 worth of stock was afterwards sold. In December, 1897, Timbrell died; and it was then discovered that the signature of Honnywill to the deed of transfer was a forgery. In April, 1900, Honnywill brought an action against the Corporation for the rectification of the register by the insertion of his name as the holder of the stock; and, in compliance with the judgment in the action, they purchased the stock for £8645, and registered it in Honnywill's name. They also paid him £2524 in respect of dividends and interest. In October, 1901, they brought an action, claiming from the bank an indemnity for the loss they had suffered. The Lord Chief Justice characterized the case as a most important one, raising as it did the question of which of two innocent parties should bear the loss occasioned by a false transfer of stock. He held that the defendants were liable. Hence the appeal, which their Lordships allowed, with costs; their opinion being that no warranty of the due execution of the transfer ought to be implied in its tender to the Corporation for acceptance, and that it would not be right to imply against the defendants a contract of indemnity.

Water-Works for Padstow.—On Monday, the 3rd inst., a scheme which has for some time been under discussion for the supply of Padstow with water was brought to a satisfactory completion. The Local Government Board sanctioned a loan of £4735, and contracts were entered into for the works to be finished by the 1st of June this year; but progress was unavoidably retarded. The opening ceremony was performed by Mr. C. G. Prideaux-Brune, the Lord of the Manor. The reservoir is situated about three-quarters of a mile from the town.

Water Consumption in Washington.—The consumption of water in Washington is increasing rapidly, and amounted to upwards of 200 gallons per head daily in June, according to the annual report of Col. A. M. Miller, of the United States Corps of Engineers. The "Engineering Record" points out that this is a subject of great importance, because the operation of the filtration works now under construction will add about 25s. per million gallons to the cost of the water, and waste will entail an additional expense to the consumers in consequence. The only remedies to be considered are the introduction of meters, which is again recommended, and the construction of a second aqueduct. There have been some unusually interesting examinations of water waste in Washington, which show great carelessness on the part of consumers; and meters would unquestionably reduce this.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN GAS COMPANY.

The Ordinary Half-Yearly General Meeting of the Company was held last Wednesday, at the City Terminus Hotel, Cannon Street—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Frank Bush) read the notice convening the meeting, and also the minutes of the last ordinary meeting. The seal of the Company was affixed to the register of proprietors; and the report and accounts for the six months ending June 30 [given in the "JOURNAL" for the 4th inst.] were presented.

The CHAIRMAN: It now becomes my duty to move—"That the report and accounts now presented be received and adopted, and the report entered on the minutes." The report, of course, will be taken as read, as usual; and I do not think there is much requiring comment in the matter of the accounts. The first point about which a few words might be said is the question of capital; but as this will come up later on, I will reserve part of what I have to say on that heading until the resolution for the creation of additional capital is put before you. I may say, however, that the Directors are fully alive to the necessity of keeping the capital account down. It mounts up every half year. During the past half there was an increase of £64,067; £18,000 of which was for East Greenwich, where we are building an entirely new gas-works to produce about 6 million cubic feet of gas a day—making the fifth section of these works. Then the next is an item of £11,000 for new land, part of the purchase of land we are now making. There is nothing charged to capital for alterations or improvements at any of our old stations; all the outlay being charged to revenue, as I think we wisely ought to do. But, as shown in Account No. 3, new and additional mains and services cost £14,082, new and additional meters £13,254, and new and additional stoves £7033. This all means increase of business; and when I tell you that in the course of the year we have added 1149 to our ordinary consumers and 16,137 to the slot-meter consumers, you will understand that a considerable outlay of capital is necessary to meet these expenses. We have 17,200 consumers more than we had twelve months ago. We have also supplied 3667 cooking stoves to the ordinary consumers, and 15,106 to slot-meter consumers, or an addition of upwards of 18,700 stoves in the year; and yet, notwithstanding this great addition to the actual number of customers, the increase in the gas sold is only ¾ per cent. over the corresponding half of last year. This, I think, is greatly due to improvements in the burning of gas. It is not due to the falling off of business, because, as I have told you, we have 17,000 additional consumers and 18,000 additional cooking-stoves. What the Company have done has been to supply, under their Act, new and improved burners—the best burner that could be obtained or could be made for burning ordinary gas on the flat-flame system. We have supplied these by hundreds of thousands to our consumers in exchange for burners that did not, many of them, give much more than half the light that is now obtained from these improved burners with a lower quality of gas. Then there is another great improvement in the consumption of gas by means of the Welsbach incandescent mantle. We have now a very large staff of men—between 60 and 70—engaged at the present moment in doing nothing but visit the consumers and attend to their incandescent mantles. Well, the result of the recent introduction of the improved flat-flame burners, whereby the illumination is nearly doubled compared with that obtained from the old and unsuitable burners, and of the incandescent mantle, whereby the light is increased about sixfold, is that the consumers burn less gas; so that whereas, with this additional business, we ought to have had an increase of about 160 million cubic feet of gas in the half year, we have only had an increase of about 42 millions. But the effect has also been to add to the stability of the Company. There are those who believe that gas companies wish the consumers to burn gas wastefully and extravagantly. That is a total mistake. It is to our interest, as I think, looking at it broadly and wisely, to enable the consumers to get the gas as cheaply as possible, not only in the matter of its price, but also in the matter of burning it, because thereby we strengthen our position, and are able to defy competition. Where incandescent mantles are supplied, the reduction in the consumers' bills is very large. The next paragraph of the report deals with the question of the dividend. We there state to the public and the shareholders that we recommend the payment of the full dividend to which the shareholders are entitled under the sliding-scale—viz., at the rate of £5 6s. 8d. per annum. But that is not the interest received by the shareholders on their investment. Some people believe that gas companies are still in receipt of exorbitant dividends—"bloated dividends" is the common expression; but, instead of that, our shareholders are only getting 4¼ per cent. interest on their money. A very large proportion of the capital has now been issued to the public under what are known as the auction clauses—that is to say, at the market price of the stock. That price is now 125. We issued stock this year at 120; the market price being rather below that figure at the time. At 125, the investor only gets 4¼ per cent. for his money; at 120, he gets a little more. But nobody can say this is an extravagant dividend to be obtained in a purely industrial business. I wish to emphasize the fact that, so far as the shareholders are concerned, they now only get a very moderate rate of interest for their money, for all new capital since 1876 has been issued under the auction clauses. The third paragraph of the report deals mainly with the question of the insurance fund. It tells you that the amount brought forward from the December half year was £11,177; so that, with the half-year's surplus of £32,000, we have £43,000 surplus to deal with. From this, the Directors propose to take £17,000 to add to the insurance fund. You may ask, Why do we do this? The insurance fund is an extremely useful one. It is (to quote the Act of Parliament) "to meet any extraordinary claim, demand, or charge which may at any time arise against or fall upon the Company from accident,

strikes, or other circumstances which, in the opinion of the Auditor, due care and management could not have prevented." In 1889, when our strike commenced, we had an insurance fund of £40,000; and the Auditor sanctioned the taking of £30,000 from it to pay part of the cost. The strike really cost, directly and indirectly, not less than £100,000. If we had had a larger insurance fund, such as we have now, we should have taken more from it, and less would have come out of the pockets of the shareholders. Then there are other circumstances. There are accidents, and such things as fires have been caused by escapes of gas. Gas Companies in London have had to pay large sums for accidents caused by escapes. Some years ago, the Liverpool landing-stage was destroyed; and the Liverpool United Gas Company had to pay something like £87,000 as compensation for that loss. The insurance fund is to meet all such charges as this. At present, with the £17,000 added, it amounts to £90,000. What one would like is to see it reach £100,000; and then I think we might feel tolerably safe against such contingencies. I mention the word "strikes," but I do not include these as a possible contingency, because I believe such a thing as a strike is simply impossible. The next paragraph relates to the reduction in the illuminating power of the gas by two candles—from 16 to 14—which took place two years ago. That has not caused the consumers to burn any more gas. Taking the aggregate, we find that though the number has vastly increased, the consumption has not augmented in proportion or hardly at all. That is the best evidence we can produce to show that the reduced illuminating power suits the consumers quite as well as the higher; in fact, I may say the illuminating power is a myth - absolute nonsense. It rests with the consumer to get what illuminating power he pleases. If we are supplying 14-candle gas, the consumer can reduce it to 5 or 6 candle—generally below 10 candles; or he can increase it to 100-candle power by the incandescent mantle. So that the actual tested illuminating power is simply a nominal thing. As we state in the report: "This fact is again stated, because the London County Council strongly opposed the reduction, contending that the consumers would burn some 30 per cent. more gas, and be heavy losers thereby." Well, that was theory. Here we produce practice to show that the theory was an unsound one. What we want, and what the consumers want, is to supply them with a cheap gas that can be used not only for lighting, but also for heating purposes; and this is really the great *desideratum*. However, this paragraph of the report is simply a statement of fact. Then the statement in the next paragraph, "With the exception of the continued unfriendly action of the London County Council towards the Gas Companies," that is also a statement of fact. I may here mention that I received a letter from a shareholder complaining of these two statements as being an attack, so to speak, on the County Council. But they are simply statements of fact. I do not know that I need read the shareholder's letter; it is rather an angry one, I must confess. He says: "The attacks in your reports have influenced me in making this protest, which I prefer to do by letter rather than at a public meeting. But I shall not refrain from doing so there, if necessary." I have no objection whatever to receive letters from shareholders; in fact, I am very glad to have them, for if there is any discontent or dissatisfaction, it is better that we should know it. But I do not know that I need read the letter, or take up your time by answering it. If the shareholder is present, the proper and better course will be for him to make his statement here, and then I can reply afterwards. I repeat what is said in the last paragraph: "With the exception of the continued unfriendly action of the London County Council"—that is putting it very mildly; but I do not want to go into particulars, because I do not think it is worth troubling about. The main point of what I have to say to-day is contained in this last paragraph: "The Directors have the pleasure to state that everything is working smoothly and satisfactorily." Now there are three partners in this business. Of course, the business could not have been started without shareholders; and therefore, in point of time, they come first. But we are also partners with the consumers. The sliding-scale is most effective in this direction. It makes our interest and theirs identical. It is to our interest to sell gas at the cheapest possible price. But let me say the term "cheap and nasty" does not apply, because if we do not supply gas that is satisfactory to the consumers, they will complain about it, and they will leave us, because we have no monopoly in artificial lighting. There was a time when we had a monopoly of artificial lighting. Before the introduction of cheap mineral oil, the only competitor of gas was candles and colza or sperm oil. The price of colza was then about 5s. per gallon, and of sperm something like 7s.; and as those were out of the question, gas was practically the only artificial light. There was no competing gas company and there was no competition by electricity or other artificial light. But now things are totally different. If a customer is not satisfied with the light we send him, he leaves us. He has the cheap mineral oil, which gives a very good light indeed, or he has the alternative of the electric light; and therefore, in selling gas, we must take care that we supply a quality that is satisfactory to the consumer, or we lose his custom. We are not losing custom. Therefore I take it we are supplying our customers with that which they find to be satisfactory; and by the sliding-scale, as I have said, every reduction of the price that we can make enables us to pay a slightly higher dividend. The consumer gets £48,000 for 1d. reduction, and we get in additional dividend of about £8000; so that he gains in the proportion of about six to one. I may say another thing about the consumer. It is commonly supposed that companies have no conscience, and that they disregard the feelings and wishes of their customers. But how are companies worked and managed? Now, I have been connected with this Company all my life, and have known for many years the interior working of the Board; and I am able to say here that never in the whole of my experience in connection with the Board of this Company has there been any desire—there has certainly never been any attempt—to act unfairly towards anyone. Their desire had been to act honestly, considerately, and fairly towards everybody with whom they have to do. I am making this statement in the presence of those who know whether I am speaking the truth or not. If it were not the truth, I should go down very much in the estimation of those whose opinion I value most highly. I do not say there is anything to boast of in being honest; but I do claim for the Directors of this and other Gas Companies—for we do not stand alone—a desire to deal honestly and fairly towards everybody with whom we have to do. And that has had its reward. As I have said, an unfriendly letter from our consumers is the rarest circumstance. I was looking over the letters received by the Company this morning, and could not find a single one in which there was the slightest unfriendly expression. One gentleman says: "I have no gas for my gas-engine. Will you please come and attend to it at once." But there is nothing unfriendly in any of these letters; and I really think this is evidence that our consumers are satisfied with us, and we are satisfied with them. Then we come to the third partner, the employees; and here I think I may draw attention to this fact that nearly all the officers and workmen are at this moment shareholders in the Company—something like 4000 of them; and they have about £190,000 in the Company, or an average of about £45 apiece. Well, of course, under these circumstances it is needless to say that they are rendering willing and cheerful service, because they are in a sense serving themselves. I should like to mention another fact in reference to what we have hitherto called our profit-sharing system; and I must draw attention to it because there is a very large sum of money in the revenue account allocated to this purpose. You will see an item in the revenue account "Profit-sharing for the twelve months to June 30, 1903, £28,017." Of this, £12,000 was charged in December, and the balance this half year. Now if this great expenditure cannot be justified, it must come to an end. Well, I think that at present it is amply justified. I think, in comparison with other companies who have not adopted the system, this Company is better served by its employees than those others where the employees have no such interest in the concern. Of course, it stands to sense and reason that the man who has a direct interest in the concern in which he works must render it a more hearty service than a man who is simply a wage earner with no other interest beyond that. It is benefiting the Company, and it is benefiting the men. As I have already said, there is £190,000 in the Company's hands, and there has been a good deal more than that saved, because a great many of the men have bought their houses by it. A sum of £13,700 out of the £28,000, or close upon half, is at once invested in stock, and that is not withdrawable. The other half of the bonus—£13,700—credited to the men and officers in July, is withdrawable. It is commonly said that the British workman is not thrifty; but I will now give you the result of our system. The man who is not thrifty at once gives notice to withdraw this money; and it is paid out within two or three weeks of the issue of the books. We find that it is regularly taken out within the month of July. But in 1902, we had reached the very satisfactory figure that only about 14 per cent. of the half bonus was withdrawn. This year it has gone down to 7 per cent. Only 7 per cent. of the £13,700—that is 3½ per cent. of the £28,000—is withdrawn; the rest is saved by our employees. This is strong testimony to the thrift of the working man and of the officers; and it also shows that they are appreciating the system by taking care that it is a permanent benefit to them. I have often said that unless this system is beneficial to both parties, it must fail—it must come to an end. It is a benefit to the Company, who are getting willing and hearty service; and it is a benefit to the employees, because they are becoming persons of property. And now, gentlemen, you will ask why I have gone at length into this matter. Well, you are partners in it too. If you, the shareholders, had not been willing to agree in this great experiment, it could never have been tried; and it is of more far-reaching effect than just this Company. I have a letter here from a gentleman—I cannot give his name—who is a Commissioner sent by the Government of a very important nation to this country to inquire into the relations of labour and capital. He came to see me, and asked for further particulars, and thus writes: "May I say unofficially that your system of profit-sharing and bonus seems to me the best scheme I have heard of, and the true solution of the great problem." He has come from a nation where they are in great trouble now with regard to capital and labour and strikes. He has been investigating the matter for some time in England; and this is what he tells me in a letter I received yesterday. Well, you are taking part in what I trust and believe is a great national work. The other day, the Duke of Devonshire, speaking at the dinner of the Iron and Steel Institute, referred to this work of ours—I say "ours," all of us here, the officers, the Directors, the shareholders, the workmen—as a great and beneficent work. About two months ago, I had a message from Mr. Carnegie also—just this message: "You are on the right lines, sure." If we can show that by this means the apparently divergent interests of capital and labour can be united and made one, we are doing a work not for ourselves only, but also for the nation at large. (Applause.) I am glad to get that response, because it has always been that our shareholders have responded in the right spirit on this subject; and I am very glad to find they still maintain their good feeling towards it. There is only one thing I have to say about it. I do not like the term "profit-sharing." Mere profit-sharing is of very little use. The mere distribution of a bonus annually in cash does in some cases more harm than good; but if the men can be induced to save, it is a totally different matter. There is a term now coming into vogue, "co-partnership"—the copartnership of the worker and the capitalist; and I should like to see "profit-sharing" altered to "copartnership." I think it would be a better term. But we shall have to consider that a little further. Now, there is only one other matter. We have a satisfactory report, as you know; and I will refer you to the last line of it: "It is hoped that the time is not far distant when the price of gas will be again reduced." We are not coming to a decision to reduce it now; but I do hope at the beginning of next year, from Christmas, there will be a substantial reduction made in the price of gas. And here I may mention one little circumstance that militates against reductions at intermediate periods. When the sliding-scale was introduced, the condition was: "If in any year the price of gas shall be a penny or part of a penny below the initial price, the dividend may be increased" so much. But the local authorities and Parliament—being, I suppose, very suspicious of gas companies, or jealous of our dividends, and very anxious that we should not have a halfpenny of profit they could possibly prevent—resolved that the highest price charged in the half year, not the lowest, should govern the dividend. Well, what is the effect of that? I do not say we should have reduced, but we might have reduced, from Michaelmas. But if we had

done so, the shareholders would have got no benefit whatever from the reduction, in consequence of this cleverness, or supposed cleverness, of the local authorities and Parliament. If they had settled it that the lowest price in the half year should govern the dividend, the reduction would have taken place earlier than it now does. We should not have divided it. It would only have made a difference of a matter of £4000 to us; but we should have liked to have added it to our reserve fund. However, seeing the difficult circumstances in which the Gas Companies are placed, we wish to be in a safe position to reduce next year. Then I hope the reduction will be one that we can consider permanent, and such as will, of course, entitle the shareholders to a small increase of dividend. I have much pleasure in moving the adoption of the report.

Mr. ROBERT MORTON seconded the motion.

Mr. CLOSS: Does reduction in the price of gas involve reduction in illuminating power as well?

The CHAIRMAN: No; that was reduced nominally by two candles two years ago—from 16 to 14 candles. We can barely make 14-candle, but not 16-candle, gas from the available supply of coal.

Mr. CLOSS asked if the action of the County Council had anything to do with adulteration by water gas. The reason he asked was that gas was largely used in his own house in the bedrooms; and as he understood that water gas was highly poisonous, it made him rather apprehensive on that score.

The CHAIRMAN: I have the satisfaction of saying that we use no water gas at all. We have no water-gas plant at our works, and cannot make it.

Mr. CLOSS also asked if the £250,000 additional capital now being raised would absorb the whole of the capital and debentures which the Company were able to issue.

The CHAIRMAN: No; we have £831,224 more capital to raise—£581,224 share capital, and £250,000 debentures. In answer to further questions, the Chairman said, with regard to the item of interest allowed to depositors, the deposits in question were security for the payment of gas accounts. Upon these, 5 per cent. was allowed.

The report was then adopted.

The DEPUTY-CHAIRMAN (Mr. Simpson Rostron) moved "That a dividend at the rate of 5¾ per cent. per annum be now declared, and that the warrants be transmitted to the registered addresses of the proprietors by post." He assured the shareholders that this dividend had been honestly and truly earned, and supplemented the remarks of the Chairman as to the business being in a prosperous condition and founded on a sound basis. Though there had been 17,000 additional consumers, the Company had been able to supply all they wanted with a consumption of 23,000 tons less coal; the Engineers having been able to make no less than 479 cubic feet more gas per ton of coal. Of course, the gas was of lower quality; but, as the Chairman had shown, in consequence of the improved mode of burning, it was to all intents and purposes the same.

Dr. DRYSDALE: Am I right in saying that a ton of coal produces 12,000 cubic feet of gas?

The CHAIRMAN: 10,690 cubic feet to the ton. It was 10,290 feet last year; so we have increased it now by 400 cubic feet.

Mr. DRUMGOLD said he had great pleasure in seconding the resolution as a shareholder; and, as an employee, he had the further satisfaction that, by the copartnership arrangement—for he supposed he must not use the rather antique term profit-sharing—he had a bonus which someone had described as a dividend on labour. The system had enabled them to do much for themselves in the past, and opened out great opportunities for the future.

The CHAIRMAN: In putting this motion, I would like to say that, though we have saved a considerable quantity of coal, we have not yet saved the amount we have given to the consumers in the reduction of 2d. in consequence of the lower quality. This comes to £96,000 a year. We have not saved that yet; but we hope to do it in time.

The resolution was carried.

The CHAIRMAN: Now I have to move: "That the Directors be and are hereby authorized to raise the sum of £250,000 further capital by the issue of ordinary stock and debenture stock, in such amounts, at such times, and in such manner as they may deem desirable, pursuant to the powers contained in the Company's Acts of 1896 and 1901." There is £581,000 of ordinary capital, and £250,000 of debenture stock—still to be raised. We are obliged by an Act of Parliament to ask authority of the shareholders from time to time before we can issue new stock; but I may tell you (so that you may not be alarmed) that we hope this money will last us two or three years—a couple of years at any rate, and it will be largely required for the purchase of land. By our Bill of 1901, we got authority to purchase a large area of land at East Greenwich; and we have arranged for the purchase on terms which I think will be satisfactory. It will be a long time before the land will be required for our purpose; but even though it should never be required, it is an estate which is rapidly improving in value, and we shall certainly get our money back. But we expect that gas will go on improving and holding its own, and that this land will in time be required for gas-making purposes. The money now asked for is required partly to pay for this; and we have recently purchased the tar-works adjoining our property at East Greenwich, on land which we sold to Messrs. Forbes, Abbott, and Lennard. We have bought 5 acres of freehold land fronting the river; and these admirable tar-works, than which I think there are none better in the kingdom, have cost a little over £80,000. This money has been paid during the past month; and that is how your capital is going. But you may rest assured, ladies and gentlemen, that the Directors will be as careful as possible in raising the capital.

Mr. CLOSS asked what was being done with the land in the meantime. It might be the Greek Kalends before it was wanted.

The CHAIRMAN: We are letting it.

Mr. HOGARTH said he hoped the Board would not issue any of this stock unless the market was favourable—3 per cent. was what was aimed at.

The CHAIRMAN said they would not issue it if they could help it when the price was low.

Mr. HOGARTH: You want the £250,000 now.

The CHAIRMAN: That will carry us on for two years at any rate.

Mr. EWART seconded the resolution.

A SHAREHOLDER asked how the issue of fresh capital would affect the dividend-earning power of the Company. The Chairman, in his opening speech, did not indicate any direction in which there was a possibility of earning greater profits; but it rather seemed from the figures that the amount of gas consumed was reaching a rigid and stationary point—the number of consumers was increasing, but not the amount of gas they were burning. Consequently, it seemed to him there were the same prospects of paying the dividend they now had, more especially as the Board were talking of reducing the price of gas in the coming year. On the other hand, there were some contingencies which seemed to show that there would not be the same dividend-earning power in the future as in the past. The electric light, if the boroughs in South London were disposed, might compete very much more keenly with gas. There was also the fact that they had to look in the future to a steady increase in the price of coal, seeing that coal was getting scarcer owing to the seams being worked out. At present, coal was cheap; but he did not think they could look to it being reduced any further. Another competitor, with regard to cooking and heating, would soon be Mond gas. It was taking hold of certain manufacturing districts; and an installation of this gas in South London would certainly considerably interfere with the production and consumption of the gas supplied by the South Metropolitan Company.

The CHAIRMAN: If there are no other remarks, I will endeavour to reply. Dealing with the question of Mond gas first, there is no possibility I think of this gas coming to South London; but one reason why we applied to Parliament for the purpose of purchasing additional land was in order to be prepared to supply a low illuminating power gas for heating purposes when the time came, so that if there should be a demand for such a supply, we should have it. As to the boroughs in South London, there are four of them that have electric light installations—Bermondsey, Woolwich, Southwark, and Battersea. We have 19,022 incandescent lamps in our district—3065 with flat-flame burners; and nearly all the flat-flame burners are in boroughs where they have electric-light installations. One of these boroughs has recently given us an order to alter all their flat flame burners to the incandescent system. This is a very progressive borough; but they find electric lighting is so much dearer than gas that they have deliberately decided on gas, and given us an order to alter about 1000 of their lamps. The others are still going on with the miserable flat-flame burners; and those boroughs are worse lighted than any in South London. As to our money-earning power, I think I ought to explain that we are going through a change in the matter of the consumption of gas. Improved burners, and particularly on the incandescent system, are coming largely into use, and checking our natural increase of consumption. But for that, there would have been the same increase of 5 or 6 per cent. that we have been having for years past. The change will be effected in due course; and I hope in a short time—seeing that we can hold our own—there will come a day when gas will be more in demand than ever. This last month we have involved ourselves in an expenditure, for working capital and the rest, not far short of £100,000 for the tar-works. We should not have gone into it unless we had been assured that the works will more than pay the interest on the money we have expended on their purchase. We must have capital. We must go on supplying our customers. We cannot put on 17,000 new customers in a year without spending money. All I can say is that we have every reason to believe that this capital will be quite as productive as the other. At any rate, it bears a small proportion to the rest. The capital of the Company is very low in proportion to the business. In 1880, at the time of the amalgamation, it was 11s. per 1000 cubic feet of gas sold in the year. It has now come down to 8s. 5d.; and we are hoping it will be lower. The capital, therefore, is very low in proportion to the business; and there need be no fear whatever that the dividends will be adversely affected by this increase As to coal, it is not cheap now; it is dear. But I am looking forward to it becoming cheaper. Coal now is between 8s. and 9s. per ton free on board in the Tyne; and we have bought it at 6s. 6d. and 7s.—a good price. I hope it will come down again to 7s.; it is more likely to come down than go up. At any rate, we are quite able to hold our own with coal at its present high price.

The motion was adopted.

Dr. DRYSDALE proposed a vote of thanks to the Directors, officers, and workmen of the Company. He said he considered that the Company was really a national affair, and that Sir George Livesey and the other Directors' plan of copartnership was really one of the discoveries of the time. He thought the proprietors should heartily thank them, and express the hope that the system they had inaugurated would become universal.

Mr. HOGARTH seconded the motion; and it was carried by acclamation.

The CHAIRMAN, in reply, said: Dr. Drysdale, ladies, and gentlemen, I am very glad indeed that you have included in this vote all of us—Chairman, Directors, officers, and workmen. On behalf of the Directors, I desire to respond, and to thank you very heartily indeed for this very kind expression of your feeling towards us. We are certainly trying to do the best we can for all parties; and it is a very great satisfaction to us to find that our efforts are appreciated by the shareholders. I usually propose a vote of thanks to the officers and workmen; but as you have included them, I think the Secretary, representing one part of the staff, and the Engineer, representing the other, should have an opportunity of responding.

The CHIEF ENGINEER (Mr. C. Carpenter) acknowledged the vote on behalf of the engineering staff. With reference to the increased make of gas per ton of coal, he said he was perfectly certain this could not have been brought about simply by plant and machinery, and without loyal co-operation and pulling together of engineers, foremen, and workmen concerned. The Chairman had alluded to the number of men engaged in taking care of the incandescent burners in consumers' houses. He should like also to point out that these men were a very useful educational agency; and it was found that many people who had hitherto looked upon incandescent lighting as being troublesome, and not altogether satisfactory, had been charmed and pleased with the simple manner in which it could be kept up to perfection, and who then took the matter into their own hands. It was important now not only

to make gas economically, but also to teach consumers to use it economically. These were two matters which were constantly engaging their attention.

The SECRETARY said it was very pleasant to his side of the staff to see the position the Company now occupied. They were paying the full statutory dividend, adding to the undivided balance £16,000, and carrying to the insurance fund a very substantial sum, and, in addition, there would in all probability be a reduction in the price of gas from Christmas next. He could assure the proprietors that the officers, and he could speak for the workmen also, would do their best to bring about that happy result. One other thing he might mention. Ten years ago the reserve fund of the Company stood at £46,278, to-day it stood at £153,000; the insurance fund then stood at £13,384, and to-day at over £90,000.

The proceedings then terminated.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Wrecking of the Company's Bill—"Ignorance, Prejudice, Suspicion, and Distrust."

The Half-Yearly Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Sir GEORGE LIVESEY in the chair.

The SECRETARY (Mr. Charles M. Ohren) having read the notice convening the meeting, the Directors' report and the accounts, as summarized in last week's issue, were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the former was not a very long one; and the first two or three paragraphs dealt with matters over which he need not detain the proprietors at any length. He might, in the first place, mention that to the insurance fund, which was recently created, they had added £2400. This fund was for the purpose of meeting any unexpected losses, or expenses that they could not very well pay out of ordinary revenue. This was a very useful and necessary fund; and it ought to have been started some time ago. But "better late than never." Now they had a fund amounting to £5400. The second paragraph dealt with the dividend. Sufficient profit had been made to enable them to carry forward (in addition to the £2400 added to the insurance fund) a further £1023; making the undivided balance £2678, after paying practically the full dividend—£5 6s. 8d. per cent. There was an odd £120; but as they could not very well divide so small an amount, this had been added to the reserve fund, which would now amount to £39,147, and was a very respectable figure indeed. The important part of this meeting, however, had relation to the fourth paragraph of the report. The Bill introduced into Parliament for getting relief from various onerous and needless restrictions, which would have enabled the Company to avoid the nuisance due to the use of lime for purification, and to save the cost of useless enrichment, they had, unfortunately, been obliged to withdraw. The Company, he thought, proved their case up to the hilt before the House of Commons Committee. That Committee thoroughly understood the business, completely grasped the matters in hand, and, in fact, gave the Company all they asked for, and endorsed all they proposed. He believed the Committee would have given them more if they had asked them. The two main objects of the Bill, as he had said, were to get rid of the necessity for the use of lime in purification, and of the necessity for enriching the gas. The quality of the gas that they were required to supply—viz., 15 candles—could not be obtained from the available supplies of coal. Newcastle coal was practically the only coal that was available; other coal being dearer. Therefore, in order to comply with the requirements of Parliament in this respect the Company were obliged to enrich their gas; and for the purpose the only practicable enrichment at present was carburetted water gas. This was objectionable for various reasons; and the Directors were satisfied that it would be far better for the consumers if they could supply them with unadulterated coal gas. They proved their point, as he had said, up to the hilt before the Commons Committee. In fact, when he (the Chairman) was giving evidence, and an opposing Counsel asked him what he considered was the proper quality of gas to be supplied, the Chairman of the Committee took the answer out of his mouth, and said "If I were in the witness-box, I should say 8 candles." But the Company were asking for 13 candles. The other point was to get relief from the requirement to reduce the sulphur compounds from something under 35 grains per 100 cubic feet—that was, 1 part in 700 parts of the gas—to 22 grains on the average. To do this, they must employ lime; and the use of lime was a very great nuisance in the neighbourhood of a gas works. The Company had been prosecuted for this nuisance; but the Magistrate did not convict them, because he said he was satisfied they were trying to do the best they could, and the use of lime was unavoidable. The Company told the Magistrate (that was last November) that they intended to introduce a Bill in the next session of Parliament in order to get relief. The Commons Committee granted them relief. The Company were able to show them that 700 Acts of Parliament had been passed in the last 40 years dealing with gas undertakings, and only 50 had any restrictions at all as to sulphur. All the rest were quite free. However, when they got to the House of Lords, they had a different Committee to deal with. In the Directors' report, it was stated that the Bill was so altered by the Lords Committee that the Board withdrew it. In the first House, they had a Committee who understood the questions, and took a real interest in them; in the second House, they had a Committee who did not understand them, and were so hopelessly confused by the evidence put before them, that they had not the courage to take any independent action, and they simply said the whole of the matters must wait until a Departmental Committee of the Board of Trade had reported in regard to certain gas matters in London. The proprietors might ask, "Why did the Committee of the Lords take this action?" The answer was given in the Directors' report: "The London County Council took the lead in the opposition, without warrant from the consumers, and, with very questionable evidence, completely misled the Committee." Now this was a mere statement of fact; and the Directors were satisfied that it understated the matter. The London County Council had really no business to interfere in any matter regarding a Suburban Gas Company. Their jurisdiction had been strictly defined and limited to the three great London Gas Companies. But it so happened that a very small part of this Company's district was within the area of the County Council; and besides the County Council, the Company were opposed by the Lewisham Borough Council, the Beckenham District Council, and by Croydon. The opposition of the last-named did not amount to much; but all the authorities did their best unitedly to ruin the Bill. He thought he was justified in saying that ignorance, prejudice, suspicion, and distrust were the characteristics of their opponents. They had been told by a very high authority—and he (the Chairman) knew it was true in a great many cases—that Counsel raised "false issues." He did not say all Counsel, but a great many of them did, raise false issues, and so managed to confuse the Court, or whatever other tribunal it might be before whom they were appearing. It was so in this case; and the same statement would apply to the witnesses who were put forward by the opposition. Among the witnesses was the Chief Chemist of the London Council (Dr. Clowes); and presently he (the Chairman) would read some extracts to show the character of the evidence given by this man. One point the Company made was that a reduction of the illuminating power would be no detriment to the consumers. In 1900, the South Metropolitan Company went to Parliament for a reduction of illuminating power; and the Chief Chemist then took a leading part in the opposition of the County Council. The witnesses for the Council then said that, if the quality of the gas was reduced 2 candles, the consumers would have to burn 30 per cent. more gas, in order to get the same amount of light. The Company undertook to supply burners in every way suitable for burning this lower quality of gas. He (Sir George) was able to prove in his evidence this session that, instead of the consumers of the South Metropolitan Company burning 30 per cent. more gas in consequence of the reduced illuminating power, they had, as a matter of fact, burned less for lighting; for, considering the increase in the number of consumers, there was no increase at all due to the lower quality of gas. Now after this evidence of 1900 as to the 30 per cent. loss to the consumers, they found the County Council themselves, in the past session, introducing a Bill to compel the Gaslight and Coke Company to reduce the quality of their gas by 2 candles. The Directors therefore thought the County Council were converted to the idea that a reduced quality was for the benefit of the consumers. But, when they came to appear against the Crystal Palace Gas Bill, they not only repeated the old statement, but they exaggerated it. They said if the Company were allowed to reduce the illuminating power by 2 candles—from 15 to 13 candles—the consumers would have to burn 40 per cent. more gas. Now what were they to do with such people? They said three years ago that consumers would have to burn 30 per cent. more gas; the experience of the South Metropolitan Company showed there was no increase in the consumption; the Council themselves introduced a Bill to reduce the quality of the gas in the North of London; and then they opposed this Company's Bill, and said that if the illuminating power was reduced 2 candles, it would entail a loss on the consumers of 40 per cent.! Well, he thought that anything they might say about these people would be justified. Now in regard to the sulphur clauses. The Company proved that only 50 out of 700 gas undertakings were under sulphur restrictions; and of the 700, about 250 were corporations without any sulphur restrictions at all. All the rest were perfectly free. The County Council, between the Bill leaving the Commons and getting into the Lords, sent out queries to 530 gas undertakings. They got replies from a number of them; and, in his examination upon the returns, Dr. Clowes was asked this:—

Without taking you through all the details, which are, of course, open to examination, do you find these results—that local authorities and companies in England and Wales who either are obliged to remove sulphur compounds, or do it of their own accord, make gas in the following quantities: Local authorities, 26,500 million cubic feet; London Companies, 41,250 million cubic feet; Provincial companies, which have statutory limitations, 15,260 million cubic feet; and other Provincial companies which carry out voluntary tests, 862 million cubic feet?—Yes.

What he (the Chairman) particularly wanted to draw attention to was this, that Dr. Clowes said that local authorities making 26,500 million cubic feet carried out voluntary tests for sulphur. Then he was asked this—

Are these figures such as to make it clear that upwards of 60 per cent. of the gas produced in England and Wales is produced under restrictions as to sulphur compounds?—That is so.

Just previously the witness had said that they made only "voluntary" tests; and now here he said the gas was produced "under restrictions." And he emphasized it—

But so far as the consumer is concerned, more than 60 per cent. of the gas used is used under restrictions?—That is so.

A little further on, Dr. Clowes was cross-examined by Lord Robert Cecil, who put these questions—

You have put in a series of tables suggesting that a very large proportion of the gas supply is under sulphur restrictions?—Yes, that is so; partly voluntary and partly statutory.

And among others you have Table No. 1, which shows that 26,500 odd million cubic feet are supplied by local authorities who voluntarily put themselves under restrictions?—Yes, that is so.

In that you include Birmingham, I see?—Yes.

That accounts for 6331 millions odd?—Yes.

And I see the average amount of impurity is 33 grains?—Yes.

Dr. Clowes had the audacity to say that Birmingham, with 33 grains, was one of those who voluntarily reduced the sulphur compounds, and placed themselves under restrictions. Then, again, Lord Robert put these questions:

Do you think it fair to put in Birmingham as one of the places that is

subject to voluntary sulphur restrictions?—I take it that in tabulating this list, it implied that Birmingham was making tests.

What is the use of that?—Tests are of some advantage. We know what we are doing with our gas, and know what the gas is.

But do you suggest now that Birmingham is one of the places which is supplying gas subject to sulphur restrictions?—I do not think they ought to go as high as 33; but still I think they are doing something if they test their gas.

But they are not removing their sulphur compounds?—They are not removing them to the extent they are removing them elsewhere.

Practically not at all?—I do not know. That depends on what their coal is. I do not know what their coal is.

I am unfortunately unable to get any admissions from you. Halifax is put in the list—20 to 30 grains; Manchester, 4800 millions, 30 grains; Nelson, 2300 millions, 40 grains; and so on. And all these are included as examples of gas supplied subject to sulphur restrictions. Do you think that is fair? Who made this list?—It is made on recent returns obtained by the County Council.

This was the sort of man who gave evidence against the Company. The Chairman then proceeded to read further extracts from Dr. Clowes' evidence as to the use of incandescent burners, the tenor of which was that his own house was now partly lighted by flat-flame burners and partly by incandescents; but if he were to make a change, he would be inclined to extend the use of the flat-flame burners rather than the others. Upon this, Sir George remarked that this was an eminent scientific authority who was going back to the "dark ages." Some additional extracts from the evidence showed that Dr. Clowes questioned that incandescent gas lighting was cheaper than flat-flame lighting. All this (proceeded the Chairman) was the kind of evidence that the Directors referred to as having misled the Lords Committee. The result of this, in the first place, was that there was a loss of money in the promotion of the Bill. He did not know exactly what it was going to cost; but it would certainly be between £3000 and £4000. This would not affect the shareholders; the consumers unfortunately would have to pay it. The Company promoted the Bill more in the interests of the consumers than in the interests of the proprietors; and the consumers would have to bear the loss entailed upon them by the Local Authorities. The consumers had also sustained a further loss. He promised in Committee that, if the Bill passed, and the Company were relieved from the restrictions as to the use of lime and the enrichment of gas, they would reduce the price 2d. per 1000 cubic feet. This would have given to the consumers £10,000 a year. If they had had the lower quality of gas, and had had a little more sulphur in it, it would not have made one atom difference to the consumers. They would not have burned more gas in consequence, because the burners the Company would have supplied them with would have given a better light from the 13-candle gas than from the 15 candle. The consumers had therefore to thank the Local Authorities for depriving them of the £10,000 and the cost of promoting the Bill. The possibility was that the expenditure would be incurred over again. The Directors had not decided anything yet; but everything pointed to this, that the case was so good, and it was so necessary that they should get relief from these most absurd restrictions, that they did not intend to give up. Therefore, the probability was that the Directors would promote another Bill next session, and try again. He happened to receive a letter only that morning from a member of the House of Commons Committee, in which the writer said that he was sorry to hear what was done in the Lords. He added: "I have followed the matter with the greatest interest, and feel sure that you are right. I judge from the letter you have written on the subject, you are not unduly discouraged; and I believe you will succeed in your object." Their object was to get freedom for the gas industry, and particularly for the Company; and to do the best they could for the consumers. They were partners with the consumers, who derived far the greater benefit from the partnership. Of any savings effected, seven-eighths went to the consumers, and only one-eighth to the proprietors. The consumers had £5000, and the proprietors only £700. What was essential now was cheap gas. If, however, the cheap gas was not suitable for the consumer, he would not use it; and there was no compulsion that he should, as he could turn to cheap mineral oil or to the electric light. What they as a Company asked for was the utmost freedom, compatible with the public interest, to supply the gas which the consumer most needed. If they did not supply him with what suited him, they would lose his custom. It was no use on the first rebuff giving up this struggle. They met with wonderful success in the House of Commons, and that alone was a sufficient inducement to go on. In conclusion, the Chairman said they might congratulate themselves upon the fact that their employees were happy and contented. The greater part of them—both officers and workmen—were shareholders in the Company; and they were rendering cheerful and loyal service, and unquestionably were producing satisfactory results both for themselves, the proprietors generally, and the consumers.

Mr. ROBERT MORTON seconded the motion.

Mr. G. READ CLARKE, who is both a consumer and shareholder, having made a few inquiries, expressed the opinion that the accusations of the County Council were groundless. The Company was one which had been making its way in the world, and, under the tuition of Sir George Livesey, it had got on in a marvellous manner.

Mr. H. E. JONES expressed his great concern over the misfortune that attended the Company's Bill in the Upper House, because, he regretted to say, there were so few of those who were influential in gas matters who took the same view that their Chairman did, in which view he himself and others heartily shared. What was urgently wanted for gas was emancipation from the restrictions to which the Chairman had referred. He showed the great necessity that existed for cheap gas for heating and power, and mentioned in this connection that there was a Company in which both he and the Chairman were interested who had 700 consumers using gas for power, and their consumption was very nearly equal to the consumption of 21,000 coin-meter consumers. Of course, this large power consumption had only been got by surrendering something in price. There was a large business awaiting them in this direction, but they could not get it until they could give cheaper gas; and this they could only do by the removal of the present restrictions. That the Company's Bill was wrongfully and ignorantly opposed (the ignorance of the opposition was only matched by its virulence) was a misfortune. In the course of other remarks, he pointed out as being most significant of the status and prosperity of the undertaking that, if one went on to the Stock Market, it was found that the stock of this Company and of the South Metropolitan Company could not be bought to pay within something like ½ or ¾ per cent. of what the stock of many other companies could be bought at. He thought this was one of the results of the methods of the two Companies, of getting their stock among the consumers and workmen. However this might be, he thought there was some truth in what Mr. A. M. Paddon said in his evidence on the North Middlesex Gas Bill, that the forcing of stock on the auction market had not the effect of getting the premium upon it that they ought to have. However, there it was—the Stock Exchange lists showed them that the South Metropolitan Company and the Crystal Palace Company stood pre-eminent in this respect, and the Commercial Company were not far behind. The price of the stock was the strongest testimony that could be produced of the confidence of the public in the Company.

Mr. T. W. How said, as a resident in Beckenham, and as one who took a somewhat active part in the affairs of the district, he should like to ask whether the Chairman's remarks—his somewhat strong remarks—as applied to the London County Council would equally apply to the opposition of the Beckenham District Council. He had an object in asking this question, as no doubt the matter would arise later on.

The CHAIRMAN said the answer he had to give to that was that Beckenham put in very little evidence. They left it to the London County Council; and what they would have said he really did not know. They opposed the Company; and he included them all in the same category—the London County Council, the Lewisham Borough Council, the Beckenham District Council, and—well Croydon merely petitioned; but he thought the Beckenham people opposed the Bill as strongly as the others. He would like to include them in his remark that ignorance and prejudice were at the bottom of it. There was one witness called for the Beckenham District Council; and he gave very much the same evidence, but it was not quite so bad, as that given for the County Council. The witness had a better reputation, and was not so reckless. He (the Chairman) believed that this witness put the loss to the consumer by the reduction of the illuminating power at 4d.; whereas the County Council put it at 10d. and 1s. The Company were most anxious to work in accord with all the public bodies that they had any concern with; but the London County Council had no right to interfere with them. The Company had nothing to conceal; and they wished the public authorities with whom they had to deal to understand all their affairs. He felt sure, if they did this, the Company could show them that the Company's interests were the consumers' interests, and that the Company were trying to do the best they could. But, by their ignorance, the authorities were preventing the benefit the consumers might otherwise derive.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. JABEZ LIGHT, a dividend was declared at the rate of 5 per cent. per annum on the 5 per cent. preference stock, and of 5¾ per cent. on the ordinary stock, less income tax,

The usual votes of thanks were passed to the Chairman and Directors, and to Mr. Shoubridge and Mr. Ohren, their respective staffs, and the workmen.

BRISTOL GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, Canons' Marsh, Bristol, on Thursday—Mr. J. W. S. DIX in the chair.

The report of the Directors showed that the profit on the revenue account for the six months ending the 30th of June was £40,982. Adding the balance of £7678 brought forward, made a total of £48,660. Deducting the interest on the debentures and the dividend on the general capital stock, making together £32,600, there was left a sum of £16,060 to be carried forward. The Directors recommended a dividend at the rate of 5 per cent. per annum on the capital of the Company.

The CHAIRMAN moved the adoption of the report, and expressed satisfaction at the excellent record it contained. The Directors were very pleased to be able to put before the shareholders such accounts as those presented. It was a matter of great satisfaction to them that they had been able to pull through difficulties in the last few years arising from the advance in the price of coal. They were now in a very flourishing condition, and in a fair way of being able to go on, rather, he hoped, with the view of a reduction in the price of gas than an increase in the future. The quantity of gas made during the half year was 1137 million cubic feet—an increase of some 13 millions. As 1d. per 1000 feet was equal to about £9000, the proprietors could see what this meant. The meters in use at June, 1902, were 34,000; the number was now 36,845—an increase of 2845. The prepayment meters in use a year ago numbered 6338; now they totalled 8018; an increase of 1680. The cookers in use at June, 1902, numbered 18,368; and they had gone up to 21,384, or 3016 more. There had been fixed from June to the 8th inst. 831, and there were on order 294; so that the total cookers fixed or on order reached 22,509. The figures he had quoted showed the flourishing state of the Company. He had no fear whatever respecting the future of gas; and he hoped, by economical and good management, that they would be able, as he had said, to reduce the price rather than increase it.

Mr. STOTHERT seconded the motion; and, after a few remarks by proprietors, it was carried.

On the motion of the CHAIRMAN, seconded by Mr. ROBJENT, it was unanimously decided to increase the salary of the Secretary (Mr. J. Phillips) by £100 per annum as from the commencement of the present half year.

The dividend recommended was then declared, and the proceedings closed.

COMMERCIAL GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the six months ending June 30, which, with the accounts, will be presented at the meeting of the proprietors on the 20th inst.

The Directors submit the accounts for the half year ending the 30th of June. The revenue account shows a net profit for the half year of £66,332 15s. 5d., which, added to the balance of £10,034 18s. 7d. brought forward from last year, produces a net revenue balance of £76,367 14s. Deducting therefrom £8067 16s. 2d. for interest, and £3444 10s. for stamp duty on the increase of the nominal capital, there remains standing to the credit of the net revenue account a balance of £64,855 7s. 1cd. available for dividend. The Directors recommend the payment of dividends thereout at the rates of £5 4s. per cent. per annum upon the 4 per cent. stock of the Company, and of £5 per cent. per annum upon the 3½ per cent. stock, both less income-tax. The balance of the net revenue will be carried forward to the next half year. The Company's Bill in Parliament ("The Commercial Gas Act, 1903"), making provision for the testing of the Company's gas, has received the Royal Assent. The Directors have elected Mr. Henry Edward Jones, the late Engineer of the Company, to a seat at the Board. They have resolved to make an issue of the balance remaining unissued of capital stock and debenture stock created by the Company's Act of 1875, and to offer the capital stock in the first instance to the consumers and the employees of the Company.

The accounts accompanying the report consist of the usual statements. They show that the paid-up stock on the 30th of June amounted to £801,875; that £1,076,875 had been added on conversion, making £1,878,750; and that £356,250 was unissued out of the £2,235,000 authorized (including premiums). The total amount borrowed on the above-named date was £307,010, and £135,937 10s. was added on conversion; making a total of £442,947 10s., and leaving £107,052 10s. to be borrowed out of the £550,000 authorized. The receipts on capital account amount, with premiums, to £2,371,792 1s. 10d.; and the expenditure stands at £1,196,228 7s. 9d., with a nominal amount of £1,212,812 10s. added on conversion—together, £2,409,040 17s. 9d. There is consequently a balance of £37,248 15s. 11d. carried to the balance-sheet. The expenditure on capital account in the half year was £41,770 14s. 3d.; the largest items being £14,165 for new steamships, £12,370 for new and additional prepayment meters and fittings, £6995 for buildings and plant, and £4647 for stoves. The reserve fund amounted on June 30 to £30,196, and the insurance fund to £29,070. The following is the revenue account:—

REVENUE ACCOUNT.

Expenditure.

Manufacture of gas—		
Coals and oil, including dues, carriage, unloading, and trimming	£86,888 13 0	
Salaries of Engineer and officers at works	1,587 15 7	
Wages (carbonizing)	18,868 16 0	
Purification—including £4009 10s. 11d. for labour	8,292 15 11	
Repair and maintenance of works and plant, materials, and labour, less £407 8s. 11d. received for old materials	24,535 16 6	
		£140,173 17 0
Profit sharing		2,483 8 0
Distribution of gas—		
Salaries and wages of officers and rental clerks	£2,476 2 7	
Repair, maintenance, and renewal of mains and services, material, and labour	2,915 5 6	
Repair and renewal of meters	1,520 13 9	
" " " " stoves	3,278 3 5	
" " " " prepayment meters and fittings	3,015 5 2	
Incandescent mantle maintenance, &c.	796 11 11	
		14,022 2 4
Public lamps—lighting and repairing		2,450 12 11
Rent, rates, and taxes		9,325 2 11
Management—		
Directors' allowance	£1,250 0 0	
Company's auditors	75 0 0	
Salaries of Secretary, Accountant, and clerks	1,111 12 6	
Collectors' salaries and commission	1,637 8 4	
Prepayment meter collection	732 12 0	
Stationery and printing	91 1 11	
General charges	604 6 5	
		6,502 1 2
Bad debts		753 18 10
Law and parliamentary charges		773 17 5
Superannuations and allowances		1,191 11 11
Official officers		116 7 1
Total expenditure		£177,837 19 7
Balance carried to net revenue account		66,332 15 5
		£244,170 15 0

Receipts.

Sale of gas—		
Common gas per meter at 2s. 6d. per 1000 feet	£166,602 18 0	
Public lighting and under contracts, common gas	8,262 14 4	
	£174,865 12 4	
Less discounts and allowances	3,431 10 1	
		£171,434 2 3
Rental—		
Meter	£2,817 7 1	
Stove	3,049 16 6	
Automatic meter and fittings	4,830 16 4	
Incandescent mantle maintenance	410 9 9	
		11,103 9 8
Residual products—		
Coke, less £4711 10s. 2d for labour	£37,474 18 11	
Breeze, less £616 14s. 5d. for labour	1,158 16 4	
Tar	11,416 13 3	
Ammoniacal liquor and sulphate of ammonia	11,362 14 2	
		61,413 2 8
Miscellaneous receipts—		
Rent receivable	£180 2 11	
Transfer fees	34 17 6	
		215 0 5
Total receipts		£244,170 15 0

The following are the statements relating to the manufacturing operations of the Company in the half year:—

Statement of Coals and Oil.

Description.	In Store Dec. 31, 1902.	Received During Half Year.	Carbonized During Half Year.	Used and Sold During Half Year.	In Store June 30, 1903.
	Tons.	Tons. cwt.	Tons. cwt.	Tons. cwt.	Tons.
Common	35,796	101,196 2	108,072 12	566 10	28,353
Cannel	2,541	..	23 0	..	2,518
Total	38,337	101,196 2	108,095 12	566 10	30,871
Oil—gallons	157,158	895,308	887,974	..	164,492

Statement of Residual Products.

Description.	In Store Dec. 31, 1902.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1903.
Coke—tons	680	66,194	16,221	46,843	3,810
Breeze—tons	870	11,021	..	11,691	200
Tar—gallons	649,473	1,189,875	..	1,194,682	644,666
Ammoniacal liquor—butts	5,237	35,050	36,518	..	3,769
Sulphate of ammonia—tons	190	1,114	..	1,242	62

Statement of Gas Made, Sold, &c.

Quantity Made (meter register and estimated).	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
1,501,636	52,123	1,335,941	1,411,262	4515

SHEFFIELD UNITED GAS COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the above-named Company will present at the 97th half-yearly general meeting on the 8th prox., they point out that, by the reduction of 2d. per 1000 cubic feet in the price of gas which took effect on the 1st of April—bringing it down to 1s. 10d., 1s. 8d., and 1s. 6d., according to consumption, and to 1s. 6d. for gas-engines using 100,000 cubic feet per annum—the charges are now as low as they have ever been. They refer to the figures in the accounts accompanying the report as testimony that the prosperity of the Company is fully maintained. The revenue from the sale of gas was £119,938; from residuals, £61,433; and from meter and stove rentals, £7431—the total receipts being £190,183. The expenditure on the manufacture of gas was £109,837, of which £58,527 was for coal and £32,561 for repair and maintenance of works and plant; distribution entailed an outlay of £12,704; management cost £6257; and the total expenses were £141,585. The amount carried to the net revenue account is consequently £48,598. The Directors recommend the declaration of the usual dividends, after payment of which there will be a sum of £5480 to be added to the balance brought forward. With regard to the works, plans are being prepared for the erection of a holder at Neepsend to contain 7 million cubic feet of gas. The Company have at present ten holders, of a combined capacity of 13¾ million cubic feet; so that the proposed addition will bring up the storage to about 21 millions. This should conduce to economical working in the winter months.

BROMLEY GAS CONSUMERS' COMPANY.

The Capriciousness of Parliament on Electricity Competition and Electrolysis Questions.

The Half Yearly Meeting of the Company was held last Tuesday, at the Bell Hotel, Bromley—Mr. ALEXANDER DICKSON in the chair.

The SECRETARY (Mr. H. W. Amos) having read the notice convening the meeting,

The CHAIRMAN moved the adoption of the report and accounts. In doing so, he said the first half of the year had abundantly illustrated the changeful characteristics of our climate. Instead of frost and snow, January and February brought balmy conditions of temperature and brightness befitting springtide; and when April should have brought genial moisture, the cold as of a cloudy winter set in and remained. But the Company had, after all, an increase of 1¾ million cubic feet in the make of gas for the half year. In the month of February alone, there was a decrease of no less than 3½ million cubic feet, as compared with the previous February. Then in April, there was an increase of 2¾ millions over the previous April. These results illustrated very forcibly the alternating influences engendered by temperature and light, and that the prevalence of even great cold in a month of the late spring did not compensate the loss by both in a mild and bright month of the winter when the daylight was shorter. Their competitors for lighting business had now established their works and mains in the district. Unquestionably, the growth of the Company's business was retarded *pro tanto* by every light their competitors supplied; but the fact that, notwithstanding their inroad (and it was

substantial while they were first converting some of their customers), the Company had never failed of an increase in the total make of gas in any half year. While they lost in some of those cases part of previous consumptions, there was scarcely a single instance in which they did not retain an appreciable amount for both the lighting and heating requirements of the householder; and the new business from the growth of the district and the prepayment sales of gas in smaller quantities, had been more than a sufficient set-off, and had preserved to them that most satisfactory feature of their progress. To maintain their position, they were now again supplying gas at 3s. per 1000 cubic feet—the price current before the astounding rise in the price of coal three years ago, although the Company had still to pay something like 40 per cent. more for coal f.o.b. than formerly. They were hopeful of obtaining a substantial reduction this spring; but the gas companies had been, so far, unable to break down the strong coherence among the coalowners to maintain the recent prices. Further reductions, they said, would necessitate a corresponding lowering of wages, and probably a strike; and, until this point was settled, the gas industry must wait. The gas companies were entitled at least to say "the sooner, the better." Their experience in the gas business was not quite that of the miners; for while they were receiving the full advantages of this form of protection, the gas companies were given little either for their industry or for their property. Let him now present their most recent experience. Their neighbours, the Beckenham District Council, in the last session of Parliament, sought powers to supply electric fittings for houses, out of the monies raised on the security of the rates they compelled the Company to pay for their electric light competition with gas. The Company joined the Crystal Palace Gas Company in opposing this power, unless it were stipulated there should be no deficiency allowable on the yearly accounts of such municipal trading, so that they should not be made contributors to furnish the means of competing unfairly with their own business. Would it be credited that, although Parliament had established several precedents in similar protection clauses for gas interests, their prayer was refused? But this was not all. The same Local Authority sought power to construct and work electric tramways—not in the Bromley Company's part of the district, but in that of the Crystal Palace Gas Company. In the week before this Bill was taken, a Lords' Committee had considered the Bill of the Brighton Corporation for electric tramways and other things; and the Brighton Gas Company, who opposed it, asked for protection from damage by the electrolytic action of escaping currents on their gas-mains. This was not the first opposition raised on like grounds. Very sustained opposition to similar powers had been offered by both gas and water companies in the past; but, while proving conclusively that damage would ensue, they had been met by the reply that, the Board of Trade having issued regulations which sought to prevent it, and there being no evidence of actual damage committed, the companies were not to have the right, which was an axiom in the common law of the country against him who damaged another's property, of recovering damages against any electric tramway authority who should injure their pipes by faulty control of their motive power. The anticipated mischief from electrolysis had already occurred. The Leeds Corporation laid their electric tramrails in close contiguity to some of their own gas-pipes. Their Distributing Gas Engineer was summoned by warrant to give evidence before the Lords Committee on the Brighton Bill; and he produced pipe after pipe deeply pitted by electrolysis, and stated that in one large main of ¾ inch metal, the pitting had been so deep as to remove all but one-eighth of its thickness. Remains of lead pipes from another town, rendered useless and almost shapeless by electrolysis, were also produced. The Lords Committee having this evidence before them granted a clause giving the Brighton Gas Company the right to recover damages for any such injury to their mains, and the Bill passed with the clause in it. The other Committee of the Lords on the Beckenham Bill, having had the same witness summoned before them, and heard his evidence—facts from a witness who did not desire to take part in the proceedings—were also satisfied that actual damage had been established, and inserted a similar clause for the protection of the Crystal Palace Gas Company. This was a valuable precedent for all gas and water companies. It portended to them the restoration of the common right of recovery from anyone who damaged their property. Notwithstanding, speculative promoters of these electrical trams candidly told them that the liability of compensation for such damage was too onerous to be accepted. This was tantamount to an admission of the likelihood, if not the certainty, that damage would be done. Their only attempted extenuation was the ancient plea that they were so virtuous that nothing they did was wrong. "It must," they say, "be that other fellow who so negligently speeds about his currents for electric light." What subsequently happened was this: When the Beckenham Bill came up in the House of Lords for third reading, a supreme effort was made to get rid of this dreaded liability, and (could it be credited?) successfully. The influence of the Lord Chairman of Committees on Unopposed Bills was inveigled, under the imputation that his authority was being overruled, because he, in his sole discretion, never allowed any such clause to be inserted in an unopposed Bill. Noble peers were put up to say that there was no evidence of damage by electrolysis, although evidence of it had so recently been adduced to the Committee of Peers in the House of Lords. The fallacy that the Board of Trade regulations gave any protection to the injured if damage were done was simulated. Although everyone knew that these regulations—made before experience had moulded judgment—were only framed with the object of preventing leakage, and that despite them great damage was being done. With this extraordinary combination, engendered of the fear of imperilling authority by any new departures, of disregard of sworn evidence received, and reliance on regulations which were not only apparently powerless to prevent damage, but a protection to the wrongdoer when damage was done, the House of Lords actually rejected the clause from the Bill, which the sense of equity had led their own Committee to sanction in this and other Bills in the same session, after prolonged and patient investigation of the evidence, and inspection of sections of damaged pipes, produced—be it remembered—not by a company, but by an officer of a great municipality, unwillingly proving what had happened under their own administration, with the interests of a common purse to inspire them. Not long since, the Local Government Board issued regulations intended to prevent dogs from biting, but many learned that neglect of compliance with the regulations not only subjected them to a penalty, but that, whether regulations or no regulations, they were liable to compensate, always after the first bite, any sufferer who was damaged. Why the difference when the Board of Trade affected to muzzle the electric current, and it was allowed to wander where it would, and damage who and what it might? True the regulations were there, and might be calculated to prevent leakage—if observed. But in the other case, and generally, compensation was obtainable from any person who caused or suffered damage to be done, and it was only when damage had been done through the electrolytic action of roving currents that the companies sought to be compensated, and in this, the most efficacious way, to be protected against further injury. One heard that the Lord Chairman had expressed a certain measure of sympathy with the Gas Company at the withdrawal of the clause from the Bill, because Parliament had given like clauses in other Bills this session—a result he attributed to the passed clauses having escaped his attention. His Lordship might possibly introduce an Act to repeal them, and so ventilate the serious question involved in this dictum. With the knowledge this recent evidence of damage afforded, gas and water companies throughout the Kingdom ought to take such action as would ensure that equity should be done. The contribution the Company would make to the expense of the joint opposition to this Bill on these two points, though defeated by such means, would have, he was sure, the cordial approval of the proprietors. Turning to the accounts, he said that, although more gas had been sold by the Company, the reduction in price resulted in the gas-rental for the half year being £161 less than in the corresponding period of last year, and similarly the sale of coke had yielded £425 less. But, on the other hand, there were increases in certain items which left the total income less only by some £297. The various decreases and increases in expenditure were also noted by the Chairman (prominent among the latter being the items for repairs)—resulting in a net increase in outgoings of £523. It would therefore, he said, be seen that they had, on the balance of the account, a smaller amount to transfer to the profit and loss account by £821. Yet the amount so transferred was sufficient to discharge the interest on the loan capital, and to enable the payment of dividends at the same rates as previously, and to add £203 to the balance to be carried forward. He thought the proprietors would regard this as satisfactory. The Directors had carefully estimated the *pros* and *cons* of the twelve months before them upon the contracts they had made; and they proceeded with confidence, assured that their policy was sound and expedient for both present and future business. The works were in excellent order; the yield of gas per ton of coal carbonized was good; and they had the satisfaction of possessing a most up-to-date plant. Having mentioned that during the half year they had erected and put in operation one of Holmes's rotary washers, which was working quite satisfactorily, allusion was made to the issue of £7000 of 3½ per cent. perpetual debenture stock in January, which was effected at a very fair price, and had put them in possession of the funds it was necessary to provide for prepayment meter services. He might also acquaint the proprietors that for the portion of the district supplied under this system, they had had to find in the last few years a total of over £10,000. In addition to the other amounts written off for depreciation, this outlay was adequately written down each half year; and it now stood at the reduced figure of £6837. Some of the proprietors might have had their curiosity excited by the decreased debit for income-tax this half year. As it was not an ordinary occurrence, he would explain. They would remember the intricate question depending upon the construction of Acts of Parliament which involved an action between the Crays Gas Company and themselves to obtain a declaratory direction from the Court. Such actions were not infrequent between companies obtaining powers over common areas; and the general practice, when compiling the returns for income-tax, was to include the law costs of such actions to determine the rights of the respective parties, as part of the allowable expenditure. They had followed this practice, but were locally surcharged by the Surveyor, and their appeal to the Local Commissioners was also disallowed by them. He was so confident of the correctness of their claim that they asked for a case; and, a difference having arisen between the parties as to the form in which the case should be stated, the point was submitted to the authorities at Somerset House, with the gratifying result that the return of the amount so overpaid was directed to be made. Hence the credit in reduction of this year's amount.

The DEPUTY-CHAIRMAN (Mr. B. H. Latter) having formally seconded the motion,

Explanations were sought by Mr. SUTTON on a number of points in the accounts which have no outside interest, and which are perfectly clear to all who take an active interest in gas undertakings. To them all, the Chairman gave explicit and convincing replies; and the motion before the meeting was adopted.

Moved by the CHAIRMAN, and seconded by the DEPUTY-CHAIRMAN, dividends were declared at the rate of 6 per cent. per annum on the 5 per cent. "A" ordinary stock, and of 4½ per cent. upon the 3½ per cent. "B" ordinary stock (both less income-tax). These will absorb £6728, and leave a balance of £3721 to be carried forward to the next accounts.

On the proposition of Mr. SUTTON, hearty recognition was made of the efforts of the Directors on behalf of the Company.

The CHAIRMAN, in his response referring to one remark made by Mr. Sutton, said it would be at all times a great pleasure to the Directors to submit to the proprietors a proposal to increase the dividends. But, as they knew, the Company were subjected to competition, and they knew also the Board had taken a big step in reducing the price of gas to 3s. while the price of coal remained very much higher than it was formerly. In these circumstances, it would be seen the Directors had taken a wise course in pausing to see the result of this effort to increase the consumption, and necessarily the prosperity of the Company, before they made any further proposals to the proprietors with reference to the dividend.

This concluded the proceedings.

WANDSWORTH AND PUTNEY GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Company's Offices last Tuesday—Mr. H. E. JONES, the Deputy-Chairman, presiding, in the absence, through ill-health, of the Chairman (Mr. T. S. Howell).

The report and accounts having been presented,

The CHAIRMAN said it was his privilege to ask those present to approve of them. Referring first to the accounts, he remarked that the Company had made the usual progress; the sale of gas having increased by 7·9 per cent. In order to realize what this meant in comparison with neighbouring Gas Companies, he pointed out that the Gaslight and Coke Company had had a decrease of 4 per cent., the Commercial Company an increase of barely 2 per cent., the South Metropolitan Company an increase of scarcely ¾ per cent., and the Brentford Company—one of the most flourishing Companies round London—an increase of 4·8 per cent. This showed that where there was a chance of developing the business, the Directors of the Wandsworth Company had availed themselves of it. Passing on to the profit for the half year, the Chairman said it would be seen that the amount was £13,379, against £11,400 for the corresponding period of 1902—a matter of nearly £2000 more for the six months. The receipts for gas were £48,500, against £45,500. Coals had cost £24,800, compared with £23,500. One element of importance was that the residuals were so good. The Company had received on this account £18,200, against £14,500—an increase of £3700. Everything had been done to improve the *corpus* of the undertaking. The Directors recommended the payment of the full statutory dividend, which would amount to £10,106; so that the balance carried forward would be £1951 12s., which, he thought, was very good. The Chairman hinted at a possible reduction in the price for gas in the near future, if the present progress of the Company continued. With regard to the capital, only £5932 had been expended during the half year under notice, which was very satisfactory.

Mr. H. S. FREEMAN seconded the motion, and it was carried unanimously.

Dividends were declared at the following rates per cent. per annum for the half year: On the "A" consolidated stock, 7½; on the "B" stock, 6; on the "C" ordinary stock, 5¼.

The CHAIRMAN said that before they finished their business he wished to tender the customary thanks to the officers and staff of the Company, coupled with the names of the Secretary (Mr. C. W. Braine) and the Resident Engineer (Mr. H. O. Carr).

Colonel W. A. JONES seconded the motion, which was carried.

Mr. BRAINE and Mr. CARR having responded,

Mr. DENNY said he wished to offer a remark upon the very flourishing state of the Company. If he recollected rightly, they were supplying gas at as low a rate (2s. 4d. per 1000 cubic feet) as any Gas Company in the Metropolis; and he remarked that they were all very pleased at the manner in which the Directors were carrying on the affairs of the undertaking. He moved a vote of thanks to them.

Mr. J. HENNELL seconded the motion, which was unanimously agreed to.

Mr. JONES having suitably replied for his colleagues and himself, the proceedings terminated.

PRIMITIVA GAS AND ELECTRIC LIGHTING COMPANY, LIMITED.

The Sale of the Electric Lighting Undertaking.

An announcement was recently made in the "JOURNAL" that a provisional agreement had been effected whereby the Primitiva Gas and Electric Lighting Company of Buenos Ayres proposed to part with the electric lighting portion of their concern to a German Company. The scheme was submitted last Wednesday to a meeting of the holders of 4 per cent. first debentures in the Primitiva Company. The senior Trustee, Mr. F. C. NORTON, presided. There were three resolutions to be submitted to those present. The first sanctioned the agreement between the Company and the Deutsch-Ueberseeische Elektricitäts-Gesellschaft, subject to such variation as the Directors and Debenture Trustees might approve; the second gave the Company liberty to redeem from time to time the whole or any part of the outstanding debentures, by drawings at par, upon giving six months' notice of the amount to be redeemed; and the third authorized the making of all necessary alterations in the deed-of-trust securing the debentures.

The CHAIRMAN, before calling upon Mr. Kincaird to move the resolutions, said the scheme had been submitted to him and his co-Trustee (Mr. H. A. Trotter); and they had made certain suggestions in regard to it, which had been adopted. Under these circumstances, they, in their capacity as Trustees, were satisfied with the scheme.

Mr. JOSEPH KINCAIRD, in moving the adoption of the resolutions, stated that he had had exceptional opportunities for considering the scheme, having been a Director of the Company for some time, and before then he was a debenture holder—in fact, his principal interest was as a debenture holder. He felt very strongly that this was a very favourable move on the part of those interested in the undertaking; that the agreement with the German Company was one that should be approved by the debenture holders; and that the arrangement would, he thought, tend to the advantage of both parties.

Mr. H. T. NORTON (Solicitor), replying to a question, stated that for business reasons the Primitiva Company found it desirable to part with their undertaking to the German Company, which was a competing electrical concern. The purport of the present agreement was this: The German Company were to enter into possession of the management of the electrical part of the Primitiva Company's undertaking, and to pay an annuity at the rate of £15,000 every six months for a period of 41 years. This annuity was sufficient to redeem the whole of the outstanding debentures of the Company, and to leave a surplus to the Company. By the scheme, this money was to be paid every six months to a joint account of the Company and the Trustees for the debenture holders, and to be applied in paying off the debentures; so that the holders had a direct security that the rental and purchase money payable by the German Company would be applied to the paying off of the debentures themselves. Further conditions were explained which had for their object the protection of the Primitiva Company so long as any part of the money remained unpaid.

[In the circular addressed to the debenture holders, this further explanation is found: "Under the proposed scheme, the consideration moneys to be received are 81 half-yearly payments; the first 80 each of £15,000 and the last of £19,234—these payments being calculated to represent a principal sum of £600,000, with interest in the meanwhile on the amount unpaid at 4 per cent. per annum with half-yearly rests. After satisfaction of the whole of the above payments, the property in question will belong absolutely to the German Company."]

Mr. C. H. SANFORD seconded the resolutions.

Mr. FRANKLIN asked for information as to the position of the German Company, and as to the amount of revenue which was obtained the last year or two from the part of the property which was to be retained by the Primitiva Company.

Mr. SANFORD (who is a Director of the Primitiva Company) said the value of the property they were retaining, speaking from its income standpoint, had been from £75,000 to £80,000 per annum net for several years past; and from what the Directors had heard, it was slightly in excess for the last six months. So far as the German Company were concerned, they were very powerful, but were only earning on their capital a limited sum, because they were now working at a disadvantage, as they had not yet got thoroughly organized. It was a very large Company; and he presumed they would be earning from 5 to 6 per cent. on their capital. He believed their capital was something like £800,000. The Chairman of the German Company was the Chairman of the Deutsch Bank in Berlin.

The explanations all being regarded as very satisfactory, the resolutions were unanimously passed.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

The report of the Directors of the above-named Company which will be presented at the half-yearly general meeting next Saturday contains the gratifying announcements we were able to make in the "JOURNAL" last week of a reduction in the price of gas as from the end of the current half year, and an increase of 16·79 per cent. in the sales, compared with the first half of the year 1902. The accounts accompanying the report show that a profit of £15,388 was realized in the past six months, which, added to the amount carried forward (£6874), makes £22,262. Deducting £2386 for interest and £1512 placed to the credit of the insurance fund, the sum available for distribution is £18,364. The Directors recommend a dividend at the rate of 6 per cent. on the "A" consolidated stock, and of 4½ per cent. on the two "B" stocks. The payment of these will only require £9841; so that there will be a balance of £8523 to be carried to the next account. The Directors mention that 60 per cent. of the last issue of capital stock was taken up by residents and consumers in the Company's district. During the past half year, 19,528 tons of coal and 696,768 gallons of enriching oils were employed in the production of 416,068,000 cubic feet of gas, of which 384,801,000 cubic feet were sold and 392,630,000 cubic feet accounted for. With regard to residuals, of the 11,716 tons 16 cwt. of coke produced, 2929 tons 4 cwt. were used in making coal gas, and 4285 tons 6 cwt. in the production of carburetted water gas; 3896¼ chaldrons of breeze were made and 1536 chaldrons used; 232,222 gallons of tar were made and 252,520 gallons sold, reducing the stock to 64,338 gallons; and there were 5424 butts of ammoniacal liquor, the bulk of which was used in the manufacture of 155 tons 2 cwt. 16 lbs. of sulphate of ammonia.

PROVINCIAL GAS COMPANIES.

Increased Business at Aldershot.

The first meeting of the shareholders of the Aldershot Gas and Water Company in their new offices, described in the "JOURNAL" a few weeks ago, was characterized by a specially interesting address by the Chairman (Mr. A. F. Wilson), in moving the adoption of the report, which contained a recommendation that dividends at the rates of 11½, 8¾, and 7 per cent. per annum should be declared, less income-tax. He stated, in the first place, that the gas revenue in the six months ended June 30 showed an increase of £1626, compared with the corresponding period of last year, the principal source being £1289 from private consumers. Residuals, especially coke, had also improved. The water revenue had risen by £372. The net revenue was £6149, against £4142. The balance of profit was £10,839; and after payment of the dividends, there would remain £8035, against £7571 this time last year. The quantity of gas sold was 90,158,300 cubic feet, against 80,103,600 cubic feet before—an increase equal to more than 12½ per cent. This meant nearly a double average amount of consumption, and also greatly increased labour and expenditure of capital at the works. The gas sold per ton of coal was 8959 cubic feet, against 8184 cubic feet in the first half of 1902. This was an increase of 785 cubic feet per ton, due in a great measure to improved carbonization in the new retort-house. Notwithstanding the introduction of the electric light in Aldershot, the gas consumption, as the shareholders would have seen by the figures, showed a steady and considerable increase. The prospects of the current half year were not less bright than those of the past; and he had every reason to hope that when they met again next February, the Directors would have an account of progress and profits to present quite as satisfactory as was the case in the half year just ended. He

concluded by referring to the passing of the Bill containing the Company's Provisional Order, which he said had cost them £1000 instead of £300, owing to the mistaken eagerness of certain parties in the town. The report and accounts were unanimously adopted, and the dividends recommended were declared. The extra services of the Secretary (Mr. R. W. Edwards) in connection with the Order were acknowledged by giving him 50 guineas; and the Manager (Mr. G. P. Lewis) and staff were thanked for their devotion to the Company's interests.

Gas Holds its Own in Cornwall.

In spite of the competition of the electric light, the Directors of the Camborne Gas Company were in a position to report, at the annual meeting last Wednesday, that the consumption of gas had been in excess of any previous year, and that the profits made were sufficient to pay the usual dividend of 6 per cent. The price of gas was reduced on the 30th of June last year by 3d. per 1000 cubic feet. Mr. J. M. Holman, the Chairman, said that some shareholders were scared when the electric light was introduced; but experience had shown that even in a small town like Camborne there was room for both. As a matter of fact, they had sold nearly a million cubic feet of gas more than in the previous year. The Secretary (Mr. W. Bailey) added that, although a few of their smaller customers had taken the electric light, the Directors would be able to report next year a further increase in the consumption of gas.

Good Management and Increased Business at Portsmouth.

The accounts presented at the half-yearly general meeting of the Portsea Island Gas Company on Saturday testified to progressive business. The receipts in the six months ending the 30th of June amounted to £87,344, out of which £71,951 was expended; so that £15,393 could be carried to the profit and loss account. The receipts were close upon £5000 higher; while the expenditure was only about £3000 more than in the corresponding period of last year. In their report, the Directors stated that from the total available balance of £39,891 (exclusive of £6115 in the extraordinary renewals account) they proposed the payments of dividends at the rates per annum of 13 per cent. on the "A" and "B" shares, 12 per cent. on the "C" shares, 10 per cent. on the "D" shares, and 5 per cent. on the stock, less income-tax—leaving £25,523 to be carried forward. Satisfactory progress was reported with the new works at Hilsea. The customary statistics were furnished with regard to the working. During the half year, the coals carbonized amounted to 43,838 tons, and 420,842 gallons of oil were used. Of the 557,652,000 cubic feet of gas sent out (which was upwards of 35 million cubic feet in excess of the quantity supplied in the corresponding period last year), 537,175,300 cubic feet were accounted for. In moving the adoption of the report, the Chairman (Alderman Sir John Baker, J.P.) referred to the erection of the new works, which he characterized as a stupendous undertaking which had been called for to meet the great growth in the demands made upon the Company. During the past few years, they had gone through a crisis in meeting the difficulties and the defects of their works; but they had had the good fortune to discover one of the best among the rising engineers of the country, and they were well satisfied with the result of his experience. Mr. Ashworth had come among them; and the increase in the consumption had been 65 per cent. The Chairman also spoke of the satisfactory progress made with the automatic meters, and of the great gain which accrued to the public by the introduction of incandescent lighting. He added, in answer to a question, that the new works would probably be in use in about another year, and that their estimated cost would be £150,000. The report was adopted, and the dividends were declared. At a special meeting afterwards, the Directors were authorized to raise additional capital to the nominal amount of £240,000, under their Order of 1901.

The Second Pipe-Line from Thirlmere.—Good progress is being made with the laying of the second line of pipes for conveying water from Thirlmere to Manchester. At the meeting of the Water Committee of the Corporation on Thursday, it was reported that three-quarters of a mile of pipes had been laid in the preceding fortnight; bringing up the length completed to 27½ miles, out of a total of 46.

The Charge for Gas in the Bury Out-Districts.—At the last quarterly meeting of the Bury Town Council, the Gas Committee reported that at their meeting on the 28th ult. they had had under consideration a letter from Messrs. Taylor and Nicholson, of the Walmersley Bleach and Dye Works, pointing out that they were charged at the "added area" rate for gas consumed on their premises, although the meter was fixed inside the borough; and intimating that another firm similarly situated were only charged the same price as though their works were in the borough. A plan was submitted showing the position of the works in question, and it was resolved that the Town Clerk should inform the firm that if they were prepared to pay the rates levied within the borough they might have their gas at the borough price, and that the matter mentioned in their letter was being inquired into.

The De Brouwer Patent Coal-Projector for London.—It will be of interest to readers to learn that an installation of the De Brouwer patent projector retort-charging machinery, with retort discharging apparatus, and coal-handling plant, has been ordered by the Gaslight and Coke Company, from Messrs. W. J. Jenkins and Co., Limited, of Retford. The machinery is for the Nine Elms Gas-Works, and has to deal with the whole of the retorts in a house containing 26 beds of eights. This machinery will all be driven by electric motors. We hear of the likelihood of two other works going in for installations similar to that for Derby, which was described last week. The new projector appears to be following the De Brouwer coke-conveyor; for it is remembered that this type of conveyor is at work both at Derby and Nine Elms. One of the two other works alluded to above has five of the conveyors; and negotiations are, we know, proceeding for its installation at the second works.

CO-PARTNERY IN SOUTH LONDON GAS-WORKS.

The Position To-Day—Men's Appreciation of a Three-Quarter Hour Breakfast Time.

Invitation cards were received a few days since from the South Metropolitan and Crystal Palace District Gas Companies to a dinner to be given jointly by the Directors in connection with the profit-sharing schemes of the two concerns. On the back of one of the cards, the information was given that "the Reservists and Profit-Sharing Committee dinner last year was so satisfactory that the Directors have agreed to have a dinner this year, which, if successful, will probably be made an annual institution"—the guests to be members of the Profit-Sharing Committees, some of the foremen, and other employees who had been profit-sharers for a certain length of time, and the possessors of a certain amount of stock, together with their wives. The dinner was held last Thursday in the same dining room at the Crystal Palace in which the reservists' dinner took place towards the end of last November; and the day, which was an exceptional one compared with its predecessors for brightness, was typical of the appearance and feelings of those who were fortunately able to be present. Sir George Livesey presided; and was supported by several Directors and officers of the Companies. Altogether, the number who sat down was about 400; and it is not too much to say that the event was so successful that the men may hold the Directors to their promise to make it an annual affair.

At the close of the repast, the health of the King was drunk; and then the Chairman addressed those present. An explanation of the object of the gathering was followed by the expression of a wish that the employees of the Companies should take a rather wider view of the profit-sharing system than was commonly the case. Sir George did not think the words "profit sharing" properly expressed what the Companies were now doing. The South Metropolitan Gas Company started in 1889 with a simple system of profit-sharing. A bonus was then payable annually in cash; it might be left in the Company's hands at interest, or it might be withdrawn. This went on until 1894. Then, said the Chairman, their ideas expanded; and the present system was instituted, by which half the bonus was invested in the Company's stock and the other half was withdrawable, or might also be invested with the Company. Under the changed and existing conditions (about which more information is given hereafter), Sir George announced that it was now proposed to drop the words "profit-sharing," and adopt the term "co-partnership," which is a fuller, wider, and better one altogether than the simple term "profit-sharing." The Chairman went on to refer to the powerful influence the middle class had become in the country, and said that this class had come into existence by thrift, aided by the joint-stock limited liability system. Previous to the introduction of this system, the middle class had no outlet for their savings; and now their investments were represented by hundreds of millions. That the working class had had no share in "this great inheritance," the Chairman attributed to the fact that they had not had the opportunity; and this, he claimed, their co-partnership system gave them. He referred (as at the meeting of the South Metropolitan Gas Company the previous day) to the recognitions that had been made of the Companies' work in this direction by Mr. Carnegie and the Duke of Devonshire; and then expressed the hope that the work that had been done would spread, and be a benefit not only to the two Companies but to the whole industrial community. Referring to the hearty co-operation of the Directors, officers, men, and their wives in promoting the system, regretful allusion was made by the Chairman to the serious illness which had befallen the Secretary of the South Metropolitan Profit-Sharing Committee (Mr. Sims), whose work in the cause was acknowledged in no unstinted manner. As to the financial results of the system, in the case of the South Metropolitan Company, the men had now some £190,000 invested in stock and in the care of the Company; and Sir George hoped the day would come when they would have half a million. He said it was a libel on British working men to say they were not thrifty. Given the opportunity and inducement, they were as thrifty as any other class. In the case of the South Metropolitan Company, there was £28,000 credited to the bonus account this last July, half of which had been invested in stock, and the other half was withdrawable by the men. Of the latter half (£13,700) only £967 was withdrawn, or 7 per cent.; while in the previous year, 14 per cent. was withdrawn. The Crystal Palace District Company's men had capped this. Their bonus was a little more than £2000. Of this rather more than £1000 was invested in stock, and the other half was withdrawable. But only £5 19s. was withdrawn; and that on account of illness. No less than 93 per cent. of the South Metropolitan men had left their withdrawable money in the Company's hands; and 99½ per cent. of the Crystal Palace Company's men. After this, said the Chairman, let no one say workpeople are not thrifty. If they have the encouragement and the opportunity, he believed there was no class in the country so thrifty as they; and a working-class population of this kind would in the future be the surest hope for this country.

Though a Director of both Companies, Mr. Robert Morton was asked to address those present as a Director of the Crystal Palace Gas Company. He thought from the figures quoted by the Chairman, it would be allowed that the men of the larger Company had something to learn from those of the smaller one.

Then spokesmen appeared on behalf of the men. It fell to Mr. H. T. Manley to have the honour, on behalf of the South Metropolitan employees, of moving a vote of thanks to the Chairman and Directors for their kindness in inviting them to the dinner. He said that the men took this as another token of the thoughtfulness with which the Chairman and Directors always treated their employees, and which was very heartily appreciated. They were not unmindful of the many concessions which Sir George and the Directors showered upon them. There was one especially he had been asked by the men to thank them for; and he considered it second only in importance to the profit-sharing system—that was, the extra quarter of an hour that had been granted for breakfast time. They had, he could say, speaking from an

intimate knowledge of the feelings of the men, all found it a great boon. As to the profit-sharing scheme, he remembered the Chairman saying, at one of their early meetings, that he should like to see the men with £100,000 standing to their credit in the Company. They had nearly doubled that; and he hoped Sir George would live to see the day when the men would have the half-million he had mentioned. The motion was seconded by Mr. J. Hurst, of Vauxhall; and with some amount of pride, he pointed out that, as a result of the efforts made, the amount of the withdrawable bonus removed from the care of the Company at the Vauxhall station had been reduced from 18½ per cent. in the previous year to 1 per cent. last year. Similar hearty recognition was made on behalf of the Crystal Palace Company's men by Mr. Bathe. To the good advice given them by their officers, he attributed the fact that the Crystal Palace men stood so well in respect of the amount of withdrawable bonus left in the hands of the Company. A resolution of thanks to the Engineers and officers for the courtesy and help which the men received from them, was proposed by Mr. G. Crisp, who made an effective temperance speech. Mr. E. J. Peacock seconded; and support was given to it by Mr. Hull. All the resolutions were carried by acclamation.

Responses were first made on behalf of the officers, by Mr. Charles Carpenter, Mr. S. Y. Shoubridge, and Mr. Frank Bush. In the course of the reply of the last-named gentleman, he quoted some figures, which are peculiarly interesting. Carrying the memories of those present back to 1889, when the system first came into operation at the South Metropolitan Gas-Works, he said the Chairman was then told that there were too many "if's" about it; and it was called the "bogus scheme." If their opponents could have been present that day, they would perhaps have objected to the many thousands of pounds that stood to the credit of the men. (Laughter) What, asked Mr. Bush, had been done with this? Since 1889, the sum of £224,764 had been placed in their books. It was an amount that almost took one's breath away. What had been done with this large sum? They had well towards £110,000 of stock in the Company; and if this were valued at 123—that was, taking it at a fair figure—it came to £135,000; and in addition they had a further £58,000 in the Company's hands. So that they had now £190,000 to the credit of the employees. Going a step further, he said there were no less than 2519 men who were the holders of £5 of stock and under £50; 321 holders of £50 and under £100; 151, £100 and under £200; 40, £200 and under £300; 13, £300 and under £400; 10, £400 and under £500; and some who held over £500. All these were cases of workmen. He should like to offer his hearty congratulations to Sir George on these figures, and to express the hope that he would live a great many years to see the continuous growth of this work. He must also say there were few men who had done more for the working class than their Chairman. The wonder was there had not been a number of imitators; but probably the fact there had not been must be put down to "passive resistance." (Laughter.) In his concluding remarks, Mr. Bush deeply regretted that their friend Mr. Sims was not with them that day, owing to his serious illness. He was slightly better; and he proposed almost immediately to take a voyage to Australia. He was sure they all wished him a speedy recovery.

In his reply, the Chairman referred to the great satisfaction the Board felt at being surrounded by such a body of friends as they had in the two Companies. The desire of the Directors of both concerns had, he said, been to do what was kind and right towards their workpeople. He had been especially pleased to hear Mr. Manley's reference to the extra quarter of an hour for breakfast, making the time allowed three-quarters of an hour. He hoped the Technical Journals would emphasize this. He had tried to get other companies to adopt the same system; but they said it was not necessary. In the case of both the South Metropolitan and Crystal Palace Companies, the men and the Companies experienced the greatest benefit from it.

Subsequently, Mr. H. Austin suggested that a message of condolence should be sent to Mr. Sims; and this was heartily agreed to. Acknowledgment was also made by the Chairman of the excellent services of Mr. W. A. S. Theobald, who is acting in Mr. Sims's absence.

The men and their wives were then free to participate in the amusements of the Palace; but later in the day they met again in the same room for tea. We may safely conclude this sketch of the day's proceedings by saying that nothing but enjoyment was the lot of those who represented the co-partners of the two Companies at the Palace on Thursday. On every hand were evidences of friendship and goodwill between the workmen, Directors, and officers.

THE PUBLIC LIGHTING OF READING.

An Interesting Report—Divided Opinions and Counsels.

Not by any means before it was required, the Reading Town Council have set themselves to the duty that has long faced them (but has been neglected) of considering the better lighting of the streets. Although gas is the illuminant now employed, the system of street lighting in the borough is antiquated and inefficient; and it is surprising to an outsider that the governing body of such a place should have been content to remain so long under existing conditions, while other towns have been bringing about improvement, in the majority of cases and in the least costly manner, by adopting incandescent gas-lights. Now, however, the Council have awakened to a full appreciation of their duty in this matter; but they are wavering in their choice between competing illuminants. It is hoped they will receive adequate guidance, and look carefully into the relative advantages and cost of the respective lights before they commit the ratepayers in the matter.

The position in which the question at present stands is gathered from the proceedings at the last meeting of the Council, at which the Highways and Lighting Committee presented a report which included

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 425.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10½	Alliance & Dublin 10 p.c.	18½–19½	..	5 7 8
130,000	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd.	5⅞–6	..	5 8 4
149,000	5	,,	6½	Do. New, £4 paid	4–4½	..	5 15 7
300,000	Stk.	Aug. 13	12	Brentford Consolidated	235–240*	+1	5 0 0
300,000	,,	,,	9	Do. New	173–172*	–½	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	130–135*	+1½	3 14 1
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105–110	..	3 12 9
220,000	Stk.	Mar. 12	10⅔	Brighton & Hove Orig.	212–217	..	4 19 1
246,320	,,	,,	7½	Do. A. Ord. Stk.	151–156	..	4 19 4
450,000	20	Mar. 31	10	British.	39½–40½	..	4 18 9
100,000	Stk.	Aug. 13	6	Bromley, 5 p.c. "A".	115–120*	..	5 0 0
165,700	,,	,,	4½	Do. 3½ p.c. "B".	88–93*	+½	4 16 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅞–11¼	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93–95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	21–24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½–15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52–54	..	5 11 1
1,375,000	Stk.	Feb. 26	5⅝†	Commercial 4 p.c. Stk.	106–109	+3	4 13 5
503,750	,,	,,	5†	Do. 3½ p.c. ,,	102–105	+4	4 15 3
407,812	,,	June 11	3	Do. 3 p.c. Deb ,,	87–90	..	3 5 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	120–125	..	5 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137–142	..	4 18 7
575,000	Stk.	Feb. 26	5⅛	Crystal Palace Ord. 5 p.c.	113–118	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	120–125	..	4 0 0
11,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135–138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	17½–18½	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	12½–13½	..	5 16 8
15,243,200	Stk.	Aug. 13	4⅛	Gas-light and Coke	4 p.c. Ord.	87–87*	+3½	4 18 10
2,600,000	,,	,,	3½		3½ p.c. max.	83–85*	–¼	4 2 4
3,799,735	,,	,,	4		4 p.c. Con. Pref.	103–106*	..	3 15 6
4,193,975	,,	June 11	3		3 p.c. Con. Deb.	87–89	..	3 7 5
252,500	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.		90–95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.		15–16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental		200–205	..	4 17 7
473,600	Stk.	Aug. 13	3½	Do. 3½ p.c. Deb. Red.		99–102*	+¼	3 8 7
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.		115–120	..	5 0 0
561,000	Stk.	Feb. 26	10	Liverpool United A		221–223	+2	4 9 8
718,100	,,	,,	7	Do. do. B		166–168	..	4 3 4
306,083	,,	June 26	4	Do. do. Deb. Stk.		110–112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.		4¼–4⅜	..	5 5 3
560,000	100	April 1	5	Met. of Melbourne	5 p.c. Deb.	103–107	..	4 13 6
250,000	100	,,	4½		4½ p.c. Deb.	102–104	..	4 6 7
541,920	20	June 11	3½	Monte Video, Ltd.		9–10	..	7 0 0
1,515,892	Stk.	Aug. 13	4½	Newc'tle & G'tesh'd Con.		98–101*	..	4 9 2
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.		97–98	..	3 11 5
300,000	Stk.	May 14	8	Oriental, Ltd.		140–145	..	5 10 4
600,000	5	Mar. 31	7	Ottoman, Ltd.		5⅜–6⅜	..	5 7 8

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6⅛	Ply'mth & St'house 5 p.c.	123–128	..	4 15 8
851,070	10	April 30	7	River Plate Ord.	10¾–11¼	..	6 4 5
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94–96	..	4 3 4
250,000	10	April 17	8	San Paulo, Ltd.	1⅝–12½	..	6 8 0
135,000	Stk.	Mar. 12	10	Sheffield A	239–241	..	4 3 0
209,984	,,	,,	10	Do. B	237–240	..	4 3 4
523,498	,,	,,	10	Do. C	256–258	..	4 4 0
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111–114	..	4 7 9
6,150,000	Stk.	Aug. 13	5⅛	South Met., 4 p.c. Ord.	122–125*	+½	4 5 3
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.	83–90	..	3 6 8
380,940	Stk.	May 14	5	Southampton Ord.	105–110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102–105	..	3 16 2
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton A. 5 p.c.	117–122		4 13 4
300,520	,,	,,	4½	Tottenham and Edmonton B. 3½ p.c.	97–100	+1	4 10 0
182,380	10	June 11	8	Tuscan, Ltd.	8–9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	98–100	..	5 0 0
737,142	Stk.	Aug. 13	5	West Ham, 5 p.c. Ord.	93–98*	..	5 2 0
				WATER COMPANIES.			
780,776	Stk.	June 26	11½	Chelsea, Ord.	320–350	..	3 9 8
150,000	,,	,,	5	Do. 5 p.c. Pref.	147–150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	135–138	..	3 5 3
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb.	137–142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.	237–242	..	3 6 1
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.	128–143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	93–96	..	3 2 6
700,000	50	June 11	10	Grand Junction 10 p.c. max.	138–143	..	3 9 11
310,000	Stk.	Mar. 31	4	Grand Junction 4 p.c. Deb.	123–128	..	3 2 6
708,000	Stk.	Aug. 13	10½	Kent	290–310*	+½	3 10 0
160,000	,,	,,	7	Do. New, 7 p.c. max.	195–205*	–1½	3 8 3
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.	305–315	–5	3 9 10
406,200	100	,,	8½	Do. 7½ p.c. max.	227–230	..	3 13 11
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb.	122–127	..	3 3 0
500,000	100	Aug. 13	12⅝	New River, New Shares	425–435*	+1½	2 18 11
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.	121–124	..	3 4 6
902,300	Stk.	June 11	7½	South-wark and Ord.	260–270	–5	2 15 7
126 500	100	,,	7½	South-wark and 7½ p.c. max.	210–220	..	3 8 2
489,200	Stk.	,,	5	South-wark and 5 p.c. Pref.	148–153	..	3 5 4
1,019,585	,,	Mar. 31	4	Vauxhall 4 p.c. A Deb.	122–127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex	295–305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	136–141	..	3 3 10
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb.	94–96	..	3 2 6

* Ex div.

† Next dividend will be at this rate.

others on the subject by the Borough Surveyor. It seems that the expiration of the current contract with the Gas Company is approaching; that a Sub-Committee have been considering on several occasions the subject of prospective arrangements; and that the Committee have already adopted a resolution directing that certain streets shall be lighted by incandescent gas burners. Now it must be said that the reports of the Borough Surveyor show that he has entered into the matter in a very thorough manner; and it will be strange indeed if the Council, giving to them the measure of consideration they deserve, are led astray by any fascination for electricity to the great detriment of the ratepayers' pockets. Efficiency and low cost on the side of incandescent gas lighting are the dominating features of the reports, as the result of inquiries instituted.

In the first part of the report, the Borough Surveyor states the outcome of his investigation as to the conversion of the present lanterns from flat-flame to incandescent gas lighting. He finds that the alteration is practicable, and that the cost of removing lanterns, making the necessary alterations, and refixing same, will be only about 1s. 9d. per lantern. The whole of the existing ordinary lamps having single flat-flame burners, excepting those lamps lighting the principal thoroughfares, he urges should without delay have the lanterns altered, and a No. 3 Welsbach-Kern burner fixed in each. This would cost about 6s. 6d. per lamp. Thus the total outlay for adapting single flat-flame burner lamps to single incandescents would be about 8s. 3d. each. The number of lamps required to be dealt with in this way would be about 900; representing a total initial cost of (say) £370. The ordinary lamps existing in the principal thoroughfares, should, he advises, be provided with new and larger lanterns, the cost of providing and fixing which in place of the present ordinary lanterns would be £1 12s. each. The cost of providing and fixing a No. 3 Kern burner in these new lanterns would be about 7s. 6d. per lantern. Thus the total cost of adapting the ordinary lamps now existing in the principal thoroughfares (not being tramway routes) to the incandescent system with new lanterns would be £1 19s. 6d. per lamp. The number of lamps required to be dealt with in this way would be about 200; representing a total initial cost of (say) £400. The comparative cost per annum of the ordinary single flat-flame burner system of lighting and the No. 3 Welsbach-Kern burner system is as follows: Single flat-flame burner, 1100 lamps at £2 12s 8d. per lamp per annum, £2896 13s. 4d.; No. 3 Welsbach-Kern incandescent burner, 1100 lamps at £2 17s. 1d. per lamp per annum, £3139 11s. 8d. The illuminating candle power of the flat-flame burner is estimated to be from 10 to 12 candles; while the No. 3 Welsbach-Kern burner is estimated to be from 50 to 55 candles. The consumption of gas is practically the same for each type of burner—viz., about 3½ cubic feet per hour. There are about 47 large lamps fitted with three-flame burners in different parts of the borough, and each of these could be provided with No. 4 Welsbach-Kern duplex burners, &c., at a cost of about 12s. per lamp. The cost of altering the lanterns to receive these burners would be about 2s. 6d. each. Thus the total cost of adapting these three-flame burner lamps to duplex incandescent would be about 14s. 6d. per lamp. This rate, applied to the 47 lamps, would represent an initial cost of about £35. The comparative cost of maintenance of these 47 lamps on the different systems is as follows: Triple flat-flame burners, 47 lamps at £5 19s. 9d. per lamp per annum, £281 8s. 3d.; duplex incandescent burners, 47 lamps at £5 10s. 7d. per lamp per annum (if one burner is turned out at midnight), £259 17s. 5d. The tramway routes, other than where centre poles exist, would be dealt with in a similar way to the principal thoroughfares by adapting Welsbach No. 54 or other approved lanterns, but fixing No. 4 Kern burners to each lamp, and, where the junction of streets occur, Welsbach No. 46 or other approved lanterns fitted with No. 4 Welsbach-Kern duplex burners. The existing large lanterns which are fitted with three and five flat-flame burners could be altered and refitted with No. 4 Welsbach-Kern duplex and triplex burners respectively. The lighting of the portions of the tramway routes where centre poles exist could be effected by re-arranging the existing gas-lamps and providing such additional ones as would be required to reduce the distance between the lamps to a maximum of 40 yards—being the distance between the centre poles. The lighting could then be similar to that which is suggested for the other portions of the tramway routes. The reporter recommends that duplex incandescent burners be fitted to each lantern; and, for the sake of appearance, it might be necessary to erect new standards.

As regards the lighting of such parts of the tramway routes as electric lighting ducts have been laid in, the Sub-Committee report the terms submitted by the Directors of the Reading Electric Supply Company, Limited. The prices quoted are for lighting 128 7½-ampére direct current open type arc lamps run eight in series of 400 volts, and giving, approximately, 1000 normal candle power, and are as follows: Under an agreement for three years, not less than £26 per lamp per annum; five years, £21 per lamp per annum; seven years, £18 10s. per lamp per annum; eleven years, £16 10s. per lamp per annum. It will be observed that the amounts quoted by the Company vary between £16 10s. per lamp per annum for an eleven years' contract and £26 per lamp per annum if the contract is for three years only; the difference being due to the fact that the capital outlay which the Company will incur in connection with the matter is to be repaid by the Corporation during the period of the contract, and, of course, if the contract is for three years only the annual payments in this respect will of necessity be heavier than if spread over a longer period.

The Sub-Committee have also considered a report which has been submitted to them by the Borough Engineer, as to the comparative cost of lighting the tramway routes by electricity and by incandescent gas-burners. In doing this, he treats the Electric Light Company very generously; his estimate of the cost of lighting by the arc system, so as to compare the cost of the incandescent gas system, being based on the assumption that the eleven years' period stated in the Company's estimate is adopted. The electric light therefore gets the credit of the minimum charge per lamp per annum—viz., £16 10s. If the centre poles are to be lighted by the incandescent gas system, he assumes

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that the present ordinary gas-lamps will be removed and that two columns of approved design will be erected on the footpaths immediately opposite each centre pole, and provided with Welsbach No. 46 or other approved lanterns fitted with No. 4 Welsbach-Kern duplex burners—the illuminating power opposite each centre pole being about 300 candles, or 150 candles on each side of the street. By lighting the centre poles from each side of the street, all shadows will be avoided. The cost per annum of lighting 108 centre poles by arc lamps is £1782, and the total cost of lighting for a period of eleven years at £1782 per annum is £19 602. The initial cost of lighting the centre poles by incandescent gas is about £1200; the annual cost of maintenance will be about £1200, and the total cost of lighting for the period of eleven years at £1200 per annum, £13,200—total, £14,400. Thus there will be a difference in cost in eleven years if the incandescent gas system is adopted of £5202; or an average money saving per year for the eleven years of £472 18s. 2d. In considering this statistical comparison of the cost of gas and electricity, it must, says the Borough Engineer, be borne in mind that the nominal illuminating power of the single arc lamp intended to be used is equal to about 1000 candles, while the illuminating power of the two No. 4 Welsbach-Kern duplex burners opposite each centre pole is equal to 300 candles. The illuminating power of the arc lamp is, of course, more in evidence when placed in a central position; and therefore on side pole brackets the full illuminating power of the electric arc would not be realized, owing to the line of buildings absorbing some of its rays. The estimated cost of lighting by arc lamps from alternative side pole on the portions of the tramway routes before referred to will be £825; and the total estimated cost of lighting for the period of eleven years at £825 per annum will be £9075. The initial cost of lighting these portions of the routes by the incandescent gas system, adopting the maximum distance of lamp-posts at 40 yards, and lighting by means of No. 4 Welsbach-Kern duplex burners, is about £130, and the annual cost of maintenance about £300. Therefore the annual cost of lighting for the period of eleven years at £300 per annum would be £3300—total £3430. The saving in the eleven years if the incandescent gas system is adopted would be £5645—the average yearly saving for the period of eleven years being £513 3s. 8d. Coming to the question of lighting the remaining portions of the tramway routes by the incandescent gas system in lieu of the present ordinary flat-flame burner system, the Borough Surveyor's estimate is based on the lamps being fixed at the maximum distance of 40 yards, and adopting Welsbach No. 46 or other approved lantern fitted with No. 4 Welsbach-Kern duplex burners. On these routes, 80 extra lamp columns will be required; but as he has allowed for a better style of column on the centre pole routes, there will be a surplus of about 71 ordinary columns, which will therefore leave nine to be provided. He estimates the total initial cost of lighting these routes by the incandescent gas system as about £500, and the annual cost of maintenance as about £1100.

Having fully considered the matter, the Sub-Committe recommended that the principal parts of the tramway routes should be lighted by electricity, the lamps to be erected upon every centre trolley pole along these routes and upon every alternate side trolley pole in such parts of the routes where centre poles have not been erected—the contract to be for eleven years, determinable at the end of the third, fifth, or seventh year of the term upon repayment by the Corporation of such part of the Company's capital outlay in connection with the matter as has not been then repaid. They further recommended that the remaining parts of the tramway routes be lighted by means of incandescent gas; the lamps to be placed not less than 40 yards apart, and to be fitted with No. 4 Welsbach-Kern burners, giving a nominal light of 150 candles. They also recommended that the remainder of the streets of the town be lighted by lamps fitted with No. 3 Welsbach-Kern burners; that in the streets where incandescent lamps are to be erected, all existing lamps with two or more flat-flame burners should be replaced by No. 4 Welsbach-Kern duplex burners, and that a contract be entered into with the Gas Company accordingly—the period of the contract to be eleven years, determinable at the option of the Corporation at the end of the third, fifth, or seventh year.

The Highways and Lighting Committee adopted these recommendations; and they called the attention of the Council to the fact that if the whole of the streets are lighted in accordance with the recommendations of the Sub-Committee, an annual expenditure of about £2840 would be incurred in excess of the present cost of street lighting, in addition to an initial outlay of about £1536 in connection with the installation of incandescent gas-lights, for which no provision has been made in the estimates for the current financial year.

When the reports and recommendations came before the Council, there was a desultory discussion round about the general subject; and there appeared to be a number of members who were obviously disappointed that electricity had not a larger share in the proposed reformation in the public lighting. In the result, the matter was referred to a Committee of the whole Council; and a subsequent resolution was passed to the effect that the Gas Company and the Electric Light Company should be asked to submit schemes.

THE PUBLIC LIGHTING OF ISLINGTON.

Gas v. Electricity.

At the Meeting of the Islington Borough Council on the 7th inst., the subject of the lighting of the public thoroughfares of the borough was again under consideration.

Mr. LAMBERT moved that three roads in Highbury should be lighted by 23 electric arc lamps. He said the Council had the whole of the lamp-columns and lanterns, and had entered into a contract for the mains to be laid. Were they now, after going to all this expense, to draw back simply and solely because the elections would be on in November?

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Alderman CUFFLIN proposed an amendment to the effect that the matter be deferred, and that in the meantime the roads be lighted by incandescent gas. He said he was desirous of raising the whole question of arc lamps. The time had come for the Council to take the matter into earnest consideration. If the electric light was adopted for the three roads proposed, the cost for current and maintenance would be £1138 a year. [Mr. LAMBERT: £655.] He based his statement upon the figures supplied by the officials. The cost of lighting the roads in question with incandescent gas would be £185 per annum. He would remind the Council that in 1894 their streets were lighted at an annual expense of £14,645; while the estimate now brought up for lighting was £32,001—an increase of £17,356 in ten years, or something like 2¾d. in the pound on the rates. Was this expenditure going to be still further increased by extending the electric light throughout the streets of the borough?

Mr. POLAK: Yes.

Alderman CUFFLIN: Then I respectfully ask the Council to say "No." I ask you to be more economical, and to say that, until the electric light can be produced at a much cheaper rate, we must not light any more streets with it.

Mr. DOHERTY, in seconding the amendment, remarked that, owing to the shadows cast by the electric light in some roads, people were unable to see properly. He thought the thoroughfares in question would be better lighted by incandescent gas than by electricity.

Mr. STONELAKE advocated every road, court, and alley in the borough being lighted by electricity.

Mr. LEMON said at the present time only one-fifth of the borough was lighted by electricity, at a cost of £18,000 per annum. Were the Council prepared to follow Mr. Stonelake, and increase the lighting rate by £100,000 a year? Members did not seem to understand the possibilities of incandescent gas. They should go to Stoke Newington, where they could see a good example.

In the result, it was resolved, by 24 votes to 13, to light one of the roads by electricity and the other two by incandescent gas.

A prolonged discussion subsequently took place upon a report from the Borough Treasurer upon the accounts of the Electric Lighting Department for the year ending March 31, from which it appeared that a heavy loss is caused by reason of the current for public lamps being supplied at less than cost price. The exact expense of production per unit of electricity during the past year was 4·44d., while the charge made to the Council was only 3½d. per unit. The Lighting Committee recommended that the charge be raised to the cost of production and maintenance. Several councillors pointed out how unfair to gas the present arrangement was. The report was referred back for further inquiry.

At a meeting of the Portsea Island Gas-Fittings Company on Saturday, a dividend of 6 per cent. for the half year ending the 30th of June was declared.

BOLTON CORPORATION GAS SUPPLY.

Treasurer's Abstract of the Annual Accounts.

The Borough Treasurer of Bolton (Mr. G. Swainson, F.S.A.A.) has issued his analysis of the accounts of the Gas Department for the year ending the 31st of March last. The capital raised amounted at that date to £733,622; being at the rate of £7 7s. 3½d. per ton of coal carbonized and 15s. 3½d. per 1000 cubic feet of gas sold. The amount expended on the works and plant, including the goodwill, is £734,136; but as £66,000 has been repaid, there is left £668,136. The manufacture of gas cost £85,549, of which £58,040 was for coal and cannel and £10,743 for wages; distribution cost £8505; management, £2376; and on renewals and for depreciation £18,542 was charged. The gross cost of gas was £122,925. As residuals, &c., produced £39,124, the net cost of gas was £83,801. The revenue was £127,030; but as the expenditure and the capital charges (£26,879) amounted to £110,680, the net profit applicable in aid of the rates was £16,350. The revenue came to 25s. 6·08d. per ton of coal carbonized and 31·73d. per 1000 cubic feet of gas sold. The net cost of gas was 16s. 9·92d. and 29·93d.; the capital charges worked out to 5s. 4·77d. and 6·71d.; and the net profit to 3s. 3·39d. and 4·09d. The quantity of coal carbonized (including 2·05 per cent. of cannel) was 99,606 tons, from which 1,019,993,000 cubic feet of gas were made. Of this quantity, 960,862,000 cubic feet were sold, or at the rate of 9646 cubic feet per ton. The unaccounted-for gas was only 4·87 per cent. of the make. The net proceeds from the sale of residuals were equal to 64·03 per cent. on the cost of coal.

WATER-GAS PLANT FOR WATSONVILLE (CAL.).

According to a copy of the "Evening Pajaronian" recently to hand, the town of Watsonville, Santa Cruz County (Cal.), is to be lighted by the Pajaro Gas and Electric Light Company. The gas plant is on the Lowe type, to be furnished by the California Light and Fuel Company; and it includes two gasholders—one having a capacity of 10,000, and the other of 50,000 cubic feet. The generating-room will contain two sets of plant of the latest design; the purifying-house will be furnished with four 10 feet square purifiers; and there will be two boilers, duplicate sets of engines and blowers, two gas-compressors, the necessary oil and water pumps, &c., and a station meter. The gas will be delivered at high pressure, which will permit of the use of smaller mains than when the ordinary holder pressure is employed; and each consumer's meter will be fitted with a regulator supplied free. There will also be provided a straining device for the purpose of checking and retaining any bits of scale, &c., likely to cause obstruction of the burners. It is not intended to wait until the completion of the entire plant before furnishing a supply of gas, but to commence as soon as

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

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sufficient is ready for making a start. The Company who are putting up the plant have, it is stated, installed the Lowe system in upwards of forty towns and cities on the Pacific Coast within the past three or four years; and, in addition to the apparatus now being supplied for Watsonville, they are erecting other sets for the neighbouring towns of Monterey and Santa Cruz.

NEW JOINT-STOCK COMPANIES.

The following new joint-stock companies have lately been registered: Arc Gas Company, Limited, with a capital of £1000, in £1 shares, to design, test, manufacture, import, export, and deal in and with chemical, electrical, magnetic, scientific, and other products, apparatus, appliances, and accessories, particularly in connection with the production of light for streets, buildings, or otherwise; and to carry on the business of electricians, electrical, metallurgical, mechanical, chemical, and general engineers, suppliers of electrical or other light, heat, power, or sound, manufacturers of lamps, globes, and glasses, metal founders, &c. There will be no initial public issue. Holderness Gas Company, Limited, with a capital of £10,000, in £1 shares (3000 preference), to produce and supply gas (and electricity, if deemed advisable by the Board) to Withernsea and other districts in Holderness, in the East Riding of Yorkshire; to manufacture and deal in coke, coal tar, pitch, asphalte, ammoniacal liquor, and residual products obtained in the manufacture of gas, oil, or other illuminating or heating materials, &c. No initial public issue. Presteign Water Company, Limited, with a capital of £2500, in £10 shares, to provide the town and district of Presteign, Radnor, with water; to acquire the new mill and water-wheel, mill leet, and water power belonging thereto, and all water rights, easements, and wayleaves connected with the Colebrook Spring, and rights for the erection of a reservoir and other works in a field of Lady M. S. J. Brydges and Colonel E. S. L. Scudamore; and to carry on the business of a water company generally.

Incandescent Lighting at Peterborough.—Incandescent gas-lights are to be generally adopted in Peterborough outside the area of the Corporation's electricity supply, by a mutual arrangement with the Gas Company. The Corporation have agreed to the hire of the lamps for a certain number of years, on the Company agreeing to supply the light at a reduced rate.

Reduced Price for Gas-Engine Supplies at Selby.—The Selby Urban District Council have agreed to supply a local firm, who have undertaken to put down two 80-horse power gas-engines, with gas at 2s. 4d. per 1000 cubic feet (instead of 2s. 8d., to which it has been lowered to the North-Eastern Railway Company), if they guarantee to consume 3 million cubic feet per annum; otherwise the price to be 2s. 6d. Should this arrangement be definitely settled, the Railway Company will have their figure brought down to 2s. 4d.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Arbroath Town Council had various gas matters before them on Monday. Mr. Robbie, the Convener of the Gas Committee, said the Auditor was satisfied that the sum of £1500 a year was sufficient to set aside for creating a sinking fund of £22,000. The Committee had resolved to reduce the price of gas from 4s. 4½d. to 3s. 6½d. per 1000 cubic feet—a reduction of 10d. He thought this showed a satisfactory state of affairs at the gas-works. The reduction began with the last inspection of meters. He wished to call attention to the recommendation that a sum of £50 be voted to Mr. A. C. Young, the Manager, for his special services. If the Council had had to call in an expert to make plans and draw up specifications, for the work which was done, they would have had to pay £150 upon the outlay of £5000. But Mr. Young had carried out the entire work himself. The proposed honorarium, therefore, only amounted to 6s. 8d. per £1 of the expenditure they might have incurred. The recent inquiry by an expert had elicited the fact that the new plant laid down by Mr. Young was equal to any in Scotland. But, in addition to this, they had the other—viz., that last year's working had been most satisfactory. Mr. Robertson, in seconding, said that their present Manager had come to Arbroath at a time when gas matters were under a cloud. Mr. Lorimer moved delay. He did not do so because he took exception to any of the work which had been done by the Manager; but he thought the Committee were going a little too fast. It was proposed to give £50 for work which, according to the minutes, was not yet completed; and then it was proposed to afterwards take the Manager's salary into consideration. The proposed reduction in the price of gas was made in face of bad results which had followed a similar course elsewhere. This was the cause of the trouble at Broughty Ferry. He thought he was justified in saying that their gas-works were not in a good condition. As they knew from the report of Mr. Gillespie, the gas undertaking was practically bankrupt; and if they exposed the gas-works in the open market, they would not get anything like the price they would require for them. Of course, he knew that Mr. Young had nothing to do with this; but since he came to Arbroath, he had added considerably to the capital account. He quite agreed that the past year had turned out well; but they could not get over the fact that there had been a great deal of grumbling in the town. There had been dissatisfaction respecting the amount of the consumers' accounts. As they were aware, the illuminating power of the gas had been reduced; and this, in some way, might account for their position at present. He did not want to discourage the Manager, because he was doing his best to make the works a success; but he held that it would be only right and proper that the gratuity be delayed. He considered the proposal was premature; and he therefore moved that it be deferred to a future meeting. There was no seconder to Mr. Lorimer; and the recommendation of

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the Committee was adopted. Mr. Lorimer's fears are phantoms; and it is well for the Council that they realized them to be so, and that they did not withhold a well-merited reward to Mr. Young for his capable management of the works.

The Corporation of Greenock are again fortunate in their working of the gas undertaking. For the past year, the result is a gross profit of £14,126, and a net profit of £4533. It is expected that a reduction of 3d. per 1000 cubic feet in the price of gas will be made; making it 2s. 9d. per 1000 cubic feet. This is a reduction of 7d. in two years. I do not yet know the details of the year's working; but the result shows that Mr. Ewing, the Manager, has not abated in the ability which has made him one of the very foremost among gas managers, for it has to be remembered that he works under an exceptionally heavy load of capital, and that during the year the plant he has worked with has been very inadequate.

The Wishaw Gas Company have reduced the price of gas from 2s. 11d. to 2s. 6d. per 1000 cubic feet, and to large consumers to 2s. 4d. The Hamilton Town Council have this week resolved, on the recommendation of Mr. J. Ballantyne, the Manager, to reduce the price by 2½d. per 1000 cubic feet for motive power and for public lighting; the latter to be subject to the placing of meters on twelve of the lamps. The Port Glasgow Town Council have reduced the price from 4s. 2d. to 3s. 9d. per 1000 cubic feet.

It was reported to the Town Council of Newport (Fife) on Monday, that the Corporation Gas Department began the year with a credit balance of £593, and closed it with a balance of £871; thus showing a profit on the year's transactions of £278. All the capital necessary for the new works had been borrowed at 3½ per cent. Since the Town Council took over the gas undertaking, 150 gas cooking-stoves had been fitted up, and the consumption of gas was steadily increasing; the total quantity accounted for during the year having been upwards of 12 million cubic feet.

The Broughty Ferry Town Council on Monday gave further consideration to the gas matters of the burgh. First there was submitted a letter from Mr. J. R. Christie, who for nearly five years has been Convener of the Gas Committee, intimating his resignation of his seat at the Council. His reasons for doing so, he said, were: (*a*) He considered the summary dismissal of Mr. Waddell, the late Manager, without having given him an opportunity to defend himself, was harsh and unjust; and (*b*) because of the bitter personal *animus* directed against himself by Provost Gray, whose vindictive intolerance had been of late so pronounced that he did not feel inclined to submit to it any longer. He severed his connection with the Council very reluctantly. The work had been always congenial, and his relationship with the councillors (the Chairman excepted) had ever been of a friendly and courteous nature. Provost Gray said he considered the personal references to himself as unjust and uncalled for. He had frequently had occasion to differ from Mr. Christie on public matters; but he always did so on public grounds, not from any personal feeling. He was quite willing that the public should judge between them. This was all the notice that was taken of the resignation; nothing having been said as to whether it was accepted, or as to the filling up of the vacancy. The Council then proceeded to the consideration of the accounts and estimates. The statement of accounts showed that for the past year the receipts were estimated at £10,734, and the expenditure at £9614, which would have left a surplus of £1120, to meet a debit balance from the previous year of £1069; but that the receipts amounted to £9560, and the expenditure to £10,582—leaving a deficiency on the year's working of £1022, which, together with the debit balance from the previous year, made a total deficit of £2091, instead of an anticipated surplus of £50. It had to be noted, however, that the expenditure was made lighter to the extent of almost £300 by the non-application of sums of £126 and £173, instalments for the depreciation of gas-stoves, and for the payment for the sulphate plant, for which allowance was made in the estimates. The net amount realized from the sale of gas was £8140, as against an estimated revenue of £8612; from coke, £854, as against an estimate of £1260; and from sulphate, £238, as against an estimate of £500. The total shrinkage on these three items was £1141. On the other hand, the expenditure was under-estimated to the amount of £969. The items on which the excess principally occurred were: Coal and carriage—estimate, £3700, actual £4533; gas oil—estimate £600, actual £892; and maintenance of works and plant—estimate £150, actual £282. Of the estimates for the current year, I have already given a summary (*ante*, p. 390). The accounts and estimates were presented by Mr. Crystal, who, as Convener of the Special Committee, has taken a leading part in recent proceedings. He described the estimates as a makeshift. In this very peculiar circumstance, it was almost an impossibility to make an accurate forecast. They had altogether a deficit of nearly £3000. In framing the estimates on the basis of a charge of 3s. 4d. per 1000 feet for gas, the Committee did so simply in the desire to keep the price as low as possible; but if they were following the true state of affairs, they would have to make a much larger increase. Provost Gray said the estimates were just a rough sort of guess; he did not think they could make more of them. It was mentioned, in the course of a conversation, that the Committee had not got rid of the old coal contract, but that they were using better coal. It will not be surprising if the Corporation get into trouble over this attempt to repudiate coal, if they persist in it. But, apart from the question of coal, the Corporation have now entered upon a very makeshift policy indeed; and a makeshift which is not likely to bring credit to them. They are playing for a smaller business, which, in itself, is an axiomatic blunder. This time they have raised the price of gas to meet a past deficit. If they succeed in getting their business to go down, they will again have to raise the price, and again and again, so long as they adhere to their backward policy. The opponents of the forward policy have striven hard for the mastery. They have obtained it through the Manager having been at fault. Let them be warned, and not push their victory to the drastic conclusion they seem to be shaping their course for, or they may find it has been a dearly bought one.

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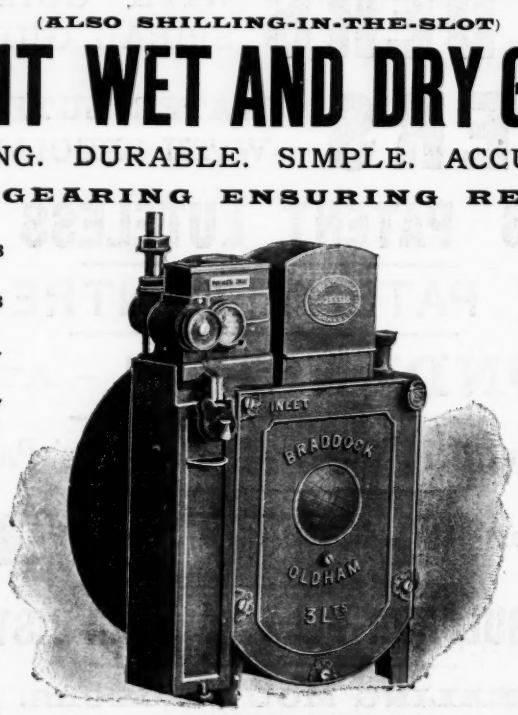

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Telegrams: "METRIQUE, LONDON." Telephone No. 248 HOP.

The Town Council of Dumfries last week discussed the subject of differential prices for gas. The difference suggested, however, was not for gas to be used for different purposes, but as to the charges to be made to the citizens of Dumfries and to consumers outside the town boundary respectively. This is a matter which, generally speaking, is not difficult to determine, because the burgh which owns the gas undertaking is so supreme in power in the district that its rulers can dictate their own terms. But in Dumfries there is the complication that across the River Nith there is a large community who have elected to maintain a distinct corporate existence—the burgh of Maxwelltown; and the inhabitants of this burgh are not by any means so helpless as would be the communities residing in scattered hamlets. It is the case, however, that while in Dumfries there is provision for levying a gas contingent rate, there is no power to impose one in Maxwelltown. It seems reasonable that there should be a higher charge for gas in Maxwelltown than in Dumfries; but the man who has business premises in Dumfries and a residence in Maxwelltown, does not see any reason why, simply because there is a river between the two places, he should pay more for his gas in the one than in the other.

It is just this element which makes caution in approaching the subject necessary. It was brought forward in the Town Council by Mr. Livingston, who said that they had a great responsibility in connection with the gas undertaking, the present debt upon which was £35,000. Their Act of Parliament said that the price of gas was to be sufficient to defray all charges for the reduction of debt, to provide a guarantee fund, and to meet all expenses connected with the manufacture and distribution of gas. He had been favoured with a look at an opinion obtained some time ago from Mr. C. J. Guthrie, K.C., who did not think that consumers outside the burgh were under like circumstances with those within. He therefore thought that the memorialists were entitled to make such charges and to prescribe such conditions as they might think expedient; but, in case section 41 of the Burghs Gas Supply (Scotland) Act, 1876, should be held to apply to consumers living outside the burgh, the memorialists ought not, among those outside consumers, to make any difference as between those who might be under like circumstances. This meant, Mr. Livingston said, that all persons who were situated outside the burgh were to be charged alike. They had been going on conferring benefits on people outside the burgh. In these circumstances, he thought they should make those outside pay a little for the reduction of the debt and other purposes. The proposal was not a new one, either in England or in Scotland. He moved that the matter be remitted to the Gas Committee for consideration. Mr. Thomson went a step further, and suggested that power should be taken—which he was told could be got cheaply—to charge more for the gas all round, and to apply the surplus to public improvements. This proposal was objected to on the ground that notice of it had not been given; but the Chairman (Bailie Cumming) thought that both proposals should go before the Committee. This was agreed to.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 15.

Sulphate of Ammonia.

Again a slow market has to be chronicled, and on the week prices have slightly declined, the closing quotations being £12 2s. 6d. per ton f.o.b. Hull, and £12 5s. per ton f.o.b. Liverpool and Leith. The bulk of the buying has again been for covering August contracts, Spain and the Continent being almost entirely indifferent. There has been fair inquiry for delivery ahead, but while buyers have been endeavouring to get in at a further decline, sellers do not seem disposed to go on at recent prices unless for near months. For delivery up to the end of the year, makers quote £12 5s. to £12 7s. 6d. per ton, according to port, while for January-April, 1904, £12 10s, per ton is generally quoted, ordinary terms.

Nitrate of Soda.

This is firm in all positions, and spot prices remain 9s. 9d. and 10s. per cwt., for ordinary and refined qualities respectively.

LONDON, *Aug.* 14.

Tar Products.

The markets are quiet; and there is very little business doing in products generally, with the exception of benzol, which certainly shows signs of improvement. A fairly good business has been done in 90 per cent. for August-October at 9d., and in 50-90 per cent. at 7d., both for home consumption. The demand for gas enriching continues good; while there are now several inquiries in the market for export. Pitch remains stationary. There is very little inquiry for delivery this year, consumers generally appearing to be well supplied, although it is just possible that some of the South Wales consumers may have to make further purchases to complete their requirements for October-December. In crude carbolic, a fairly good business is still doing at 1s. 6d. for 60's; but there is no demand for crystals. With regard to creosote, the position remains the same; and prices are well maintained for both prompt and forward delivery. The values of toluol and solvent are purely nominal. There is really no business doing in either of the articles. Tar shows signs of being a little easier in value; and there is a growing disposition on the part of gas companies to adopt the sliding-scale, this being considered to be the fairest method for both the companies and their contractors.

The average values during the week were: Tar, 23s. 6d. to 32s. 6d.; Pitch, London, 55s. to 55s. 6d.; east coast, 53s. to 53s. 6d.; west coast, 51s. to 51s. 6d. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. Crude naphtha, 2½d. to 3d.; solvent naphtha, 7d. to 8d.; heavy naphtha, 9d. Creosote, London, 1¼d. to 1½d.; North, 1¼d. Heavy oils, 2⅛d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8 10s.; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d. nominal.

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Sulphate of Ammonia.

The market is decidedly quite as regards prompt delivery; but there appears to be an improved demand for forward shipment. The Gaslight and Coke Company are still asking £12 7s. 6d. for Beckton make; but there are sellers on Beckton terms at lower prices for both prompt and forward delivery. In Leith, business is reported at £12 5s. for prompt delivery. There are buyers at this port for forward delivery; but makers decline to entertain business at present. In Liverpool, there are sellers at £12 5s.; but business appears to be restricted at this port. In Hull, prices are nominally from £12 2s. 6d. to £12 3s. 9d.; but there is really no business to report. The market closes with a quiet tone, the only inquiries being for forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

What little change there is to note in the coal trade of this district is perhaps in the direction of a tendency to more steadiness in prices, so far at least as concerns the low special quotations which have recently been somewhat current on the market to effect clearance sales of surplus output. Although during the present month holiday stoppages in the various Lancashire industrial districts are for the time being considerably interfering with manufacturing operations, with a consequent restriction of requirements for ironmaking, steam, and other purposes, and the house-fire coal trade remains in the extremely quiet condition usual at this time of the year, the season is now so well advanced that coalowners are looking forward to an early revival of increasing activity in the demand generally. In the meantime, they are keeping pits on short time, and no very heavy stocks have so far accumulated. It is anticipated that as soon as September sets in, the market will be in a stronger position; and collieries are not at all eager about pushing sales at lower prices. The cheap lots that are to be picked up are becoming more exceptional, and quotations for contracts inclined to firmness. In house-fire coals, business just drags on slowly; but, although, as usual, there are numerous complaints, the situation is not more depressed than is customary during this period of the year. Best Wigan coals are steady at about 13s. 6d. to 14s. and 14s. 6d. per ton at the pit, lower qualities of Arley and Pemberton four-feet about 11s. and 11s. 6d. to 12s. 6d., and common house fire sorts 9s. 6d. to 10s. 6d. Requirements for steam and forge purposes remain not more than moderate, and it is only in very special cases that under 8s. per ton at the pit is now being quoted, with 8s. 3d. to 8s. 6d. and 8s 9d. representing about average figures for good ordinary qualities. For shipment, only an indifferent sort of business is the general report, with, however, no change in prices, special clearance lots here and there being perhaps obtainable at 8s. 9d. to 9s., with ordinary quotations about 9s. 6d. to 9s. 9d. delivered at the ports on the Mersey. All descriptions of engine fuel, except, perhaps, some of the very inferior sorts, are meeting with a fair sale. Lancashire pit quotations are steady at 4s. and 4s. 3d. to 4s. 9d. for common slack, 5s. 3d. to 5s. 9d. for medium, and from 6s. 3d. to 6s. 9d. for the best qualities of engine fuel.

Northern Coal Trade.

There is a full demand for coals, more especially for best qualities, and prices are kept firm; but with a normal production, some of the secondary kinds are a little easier in the price. In steam coals, the demand is strong, and exports to the Baltic are now at their height. Best Northumbrian steams are about 11s. per ton f.o.b., second-class steams 9s. to 9s. 3d., and steam smalls from 5s. 4½d. to 5s. 6d. In gas coals, the demand is very full. Exports are still heavy, while there is a little stronger home demand; the shipments to the great companies in the South being now in slightly larger quantities. The prices are from 8s. 9d. to 9s. 6d. per ton f.o.b. for Durham gas coals, according to quality. There are no contracts of moment concluded this week as far as is known. In coke, the market is steady; gas coke being firm for shipment at from 14s. 3d. to 14s. 9d. per ton. Such prices, however, do not attract buyers, and are only attainable through the limited supply. At some inland works, gas coke is a little easier.

Scotch Coal Trade.

More business is being done; but it it is largely temporary, owing to the shipping season being at its height. Prices remain much the same, and are not likely to show much advance, if any, for some time, unless there should be a sudden increase in the volume of general trade. The prices quoted are: Main 8s. to 8s. 3d. per ton f.o.b. Glasgow, ell 8s. 9d. to 10s, and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 259,438 tons—an increase of 48,855 tons upon the preceding week, and 22,999 tons upon the corresponding week of last year. For the year to date, the shipments have been 7,135,112 tons—an increase of 916,682 tons upon the same period of last year.

Water Supply of La Rioja.—The Argentine Government have authorized the construction of water-works in La Rioja. The management of the undertaking will be carried on by the Director-General of National Health Works. The service is to be obligatory in the localities to which water is to be supplied.

Widnes Gas and Water Supply.—The Borough Accountant of Widnes (Mr. S. Hoyle) has issued his abstract of the accounts of the Corporation for the year ending the 31st of March last. On the gas undertaking there was a profit of £3757, and on the water undertaking one of £1571. At the meeting of the Town Council on Tuesday, the Gas, Water, and Electricity Committee presented their report for the month of July; and in moving its adoption, Mr. Wareing referred in sympathetic terms to the illness of Mr. Isaac Carr, the Engineer, who is suffering from an attack of smallpox.

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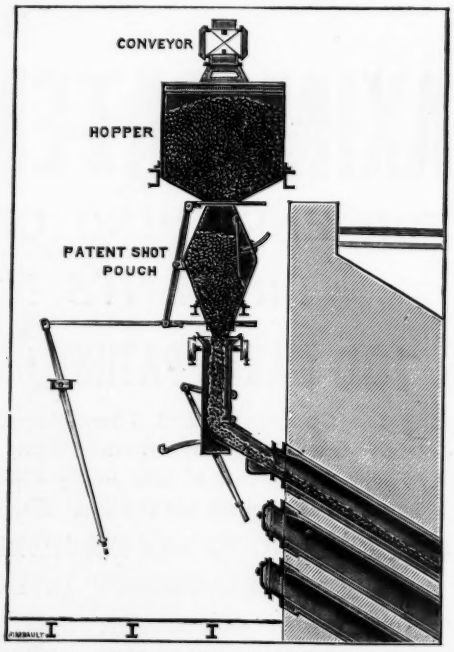

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A Proposal for Next Session.—Before the echoes of the King's Speech proroguing Parliament have died away, a proposal for next session has been published. The Doncaster Corporation intend to apply for power to borrow £50,000, of which £14,000 is for the purchase of coal in connection with the Thyrberg reservoir; £10,000 for extending the district supply of water, taking in Cantley and Sprotborough; £10,000 for a new main to Warmsworth; £10,000 for a new service reservoir at Warmsworth: and £6000 for engineering and parliamentary expenses and contingences.

The Metropolitan Water Board and the Supply of Suburban Districts.—At the last meeting of the East Molesey District Council a letter was read from the Solicitors to the Metropolitan Water Board (Messrs. Linklater), asking the Council to place at their disposal any information they possessed affecting the claims of the London Water Companies against the Board. The following were some of the particular points upon which, it was said, information would be exceedingly useful: (1) As to what, if any, illegal or improper charges had been made by the Water Companies in the Council's area; (2) any question as to the rating of the Companies; (3) insufficiency of supply; (4) any question bearing upon the state of the mains. The Clerk was instructed to furnish the information asked for, and call the attention of the Board to the question of the present system of rating reservoirs.

Metropolitan Water Board.—A special meeting of the Board was held on Friday—Mr. R. M. Beachcroft presiding. The report that was presented by the Law and Parliamentary Committee stated that the Special Arbitration Committee had called their attention to certain questions raised by the Government Auditor of the Water Companies' accounts (Mr. Allen Stoneham) in connection with his audit of the accounts of the Lambeth and Southwark and Vauxhall Companies, and of the Staines Reservoirs Joint Committee. The questions, the settlement of which might seriously affect the Board in connection with the price to be paid for the respective undertakings, were in dispute between the Auditor and the Companies and would be decided by arbitration. In such proceedings, the Auditor had himself to bear the expense of providing any legal assistance, and the question they had to ask the Board to decide was as to whether they should agree to assist Mr. Stoneham in this direction. The Committee had arranged for the necessary estimate to be submitted to the Finance Committee, and they recommended accordingly. The report was adopted.

Reductions in Price.—The Dorchester Gas Company have reduced the price of gas 2d. per 1000 cubic feet, bringing it down to 3s. 10d. A reduction of a like amount has been decided upon by the Directors of the Reading Gas Company for the borough, and of 4d. per 1000 cubic feet in the district of Caversham; no meter-rents being charged. In the report to be presented by the Directors of the Bath Gas Company at the half-yearly meeting on the 28th inst., they announce a further reduction of 1d. per 1000 cubic feet in the price of gas as from Midsummer. At their monthly meeting on Wednesday, the Selby District Council decided, on the recommendation of the Gas Committee, that the price to consumers of gas by ordinary meters, other than the North Eastern Railway Company, should be reduced from 3s. 4d. to 3s. 2d. per 1000 cubic feet, subject to existing discounts, and that the price to the Railway Company should be reduced from 2s. 11d. to 2s. 8d.; further, that a reduction of 2d. per 1000 cubic feet should be made to all consumers by prepaymemt meters as from the 30th of June last. The price of gas at Peterborough has been reduced 1d. per 1000 cubic feet. At Montrose, the Directors of the Gas Company announce a reduction of 3d. per 1000 cubic feet as from the 1st of May last; and gas used for cooking purposes will be supplied at 5d. per 1000 cubic feet below the ordinary rates.

The Stafford Town Council, at their meeting last Tuesday, devoted some time to the consideration of an application by the Gas Manager (Mr. Hubert Pooley) for an increase in his salary to the extent of £50 per annum. It was eventually, by a majority of one, decided to make the addition.

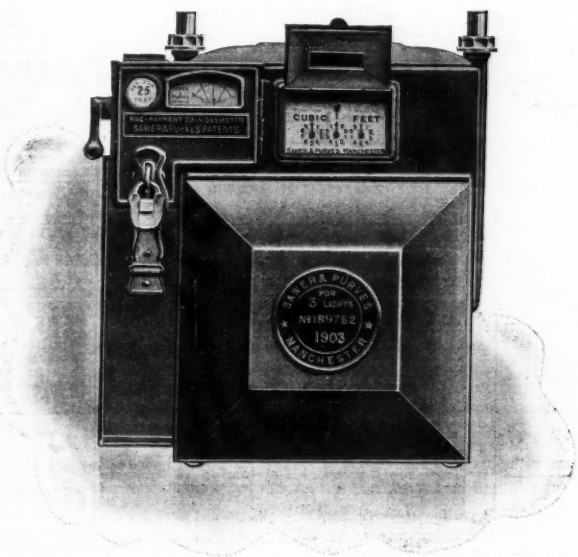
Jamaica was visited last Tuesday by a terrible tornado, by which 70 persons were killed, and between 500 and 600 injured. The eastern end of the island is completely devastated; and Kingston, the chief town, has been deprived of light and water, owing to the demolition of the works by the cyclone.

The Town Council of Bo'ness are disappointed that the Gas Company, while reducing the price of gas to ordinary consumers, have made no reduction in the charge for gas for the public lamps. It was stated at a meeting of the Council on Tuesday that the Company had fixed the charges at 13s. 6d. for ordinary lamps, and 31s. 6d. for all-night lamps, for a lighting season of 204 nights.

Incandescent gas lighting will soon be in use throughout the borough of Marylebone. Messrs. Pontifex and Co. are carrying out the contract, which is £8904 19s. 6d. for installation, and £4849 4s. 6d. per annum for five years for maintenance. Under the new system, the total estimated cost to the Borough Council for maintenance, supply of gas, &c., will be £12,244 a year, or about £800 more than at present.

According to the annual report of the Chief Officer of the Public Control Department of the London County Council (Mr. Alfred Spencer), the Council's inspectors investigated during the year 1902-3, the causes of 179 lamp accidents, 18 of which were fatal, involving the loss of 26 lives. The number of accidents is lower than in any previous year during which a systematic investigation has taken place. The number of lives lost was, however, greater than in the previous year. A return is given containing particulars of the fatal cases which occurred during the year, and a table of the lamp accidents investigated from July, 1890, to March 31, 1903, showing a total of 2642 accidents, of which 311 were fatal, and involved the loss of 349 lives in the Administrative County of London.

S&P



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GAS MAKER. Halesworth Gas-Works.
MANAGER. Abergavenny Gas-Works. Sept. 16.
RETORT SETTER. Rotherham Gas Department. Aug. 12.
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Stocks and Shares.

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NEWCASTLE AND GATESHEAD GAS COMPANY. Aug. 25.

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PUPIL.

GAS Engineer in large East Coast Town has a VACANCY for a PREMIUM PUPIL. Exceptional opportunity for gaining a splendid all-round Experience and Training.

Address No. 4084, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS MANUFACTURE EXAMINATIONS, CITY AND GUILDS.

CORRESPONDENCE CLASSES.

GENTLEMEN prepared for the above Examination, Honours or Ordinary Grade. The highest success. Two Medals last Examination; Seven Medals in Five Years. Confidential. Fees low.

Apply for Particulars to No. 4081, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

J. S. CRANMER thanks the numerous

Applicants for the Appointment of FOREMAN, and informs them that the vacancy has now been filled.

Stratford-upon-Avon, Aug. 17, 1903.

GAS-FITTERS wanted. Smart Men

used to Compo.

Apply to RICHMOND'S GAS-STOVE WORKS, STRATFORD, E.

WANTED, a Working Foreman to take charge of Dry-Meter Repairing Shop in London. Must be a thoroughly reliable Man. Age about 35 to 45.
Apply, by letter, to No. 4078, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STOKER wanted immediately (Seaside in Kent). Permanent job. Scoop work. Wages 31s. 6d. weekly.
Apply, by letter, to No. 4082, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Halesworth Gas Company require a MAN with practical knowledge of Gas-Work generally. Must be a good Stoker, to reside on Works. House, Garden, Gas, and Coals free.
Apply to ALFRED FOREMAN, 46, Thoroughfare, Halesworth, SUFFOLK.

FITTER and Smith Wanted, used to the Routine of a Gas-Works. A qualified Mechanic preferred.
Apply, by letter, stating all Particulars as to previous and present Employments, Age, and Wages required, to No. 4072, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COUNTY BOROUGH OF ROTHERHAM.
(GAS DEPARTMENT.)

WANTED, a First-Class Tinsmith, capable of Making and Repairing Street-Lamps.
Apply, stating Wages required, to the undersigned.
FRANK A. WINSTANLEY,
Engineer and Manager.

COUNTY BOROUGH OF ROTHERHAM.
(GAS DEPARTMENT.)

WANTED, a First-Class Retort Setter.
Preference given to one understanding Regenerator Furnaces and Inclines.
Apply, on or before Aug. 12, to the undersigned.
FRANK A. WINSTANLEY,
Engineer and Manager.

ENGINE AND GENERAL FITTER.

WANTED for a Gas and Water Works in Worcestershire, an Experienced and Competent FITTER. Must be capable of keeping all Machinery, including Steam and Gas Engines, Pumps, Exhausters, Coal and Coke Handling Plant, &c., in good running order. Abstainer Preferred. Age not to exceed 35. A permanency to a good man. Wages, 50s. per week.
Apply, by letter, in the first place, giving Experience and References, to No. 4074, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at a Steel Works, a thoroughly reliable HEAD CHEMIST. One with University education preferred. In addition to the ordinary routine of Steel Works Analyses, which must be correctly performed, he should have had experience in Gas Analyses, Analyses and Calculations arising in connection with the Products obtained from the destructive distillation of Coal, use of modern Pyrometers, &c., and the care and revision of records and upkeep of Instruments, Water Analyses and Water Softening, and Micrography. A man is required thoroughly versed in Theory and the Practical application of the same; and he must be a good Organizer.
Apply, stating Salary required, to No. 4079, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BROUGHTY FERRY GAS-WORKS.

WANTED, by the Town Council of the Burgh of Broughty Ferry a qualified GAS ENGINEER and MANAGER to take entire charge of their Gas Undertaking.
Salary, £225 per annum, with free House, Coal, Gas, and Taxes.
Candidates must not be over 45 Years of Age.
Candidates must state Age, Qualifications, and Particulars of Experience.
Applications, in writing, endorsed "Gas Engineer and Manager," and accompanied by Testimonials of recent date, to be lodged with the Subscriber on or before Noon of Saturday, the 29 curt.
Canvassing the Members of the Town Council, either directly or indirectly, will be a disqualification.
EDWARD COWAN,
Town Clerk.
4, High Street, Dundee,
Aug. 11, 1903.

ABERGAVENNY GAS-WORKS.

THE Town Council of Abergavenny are prepared to receive APPLICATIONS for the appointment of GAS MANAGER at their Gas-Works, Abergavenny.
Salary £160 per annum, with use of House, Coal, Gas, and Water.
Applications, in Candidates own writing, endorsed "Gas Manager," stating Age, Qualifications, and Experience, whether Married or Single, with not fewer than Three recent Testimonials, must be delivered to the Town Clerk, on or before Sept. 17, 1903.
It is necessary that Candidates should be experienced in the Working of Carburetted Water-Gas Plant, and in Regenerator Retort Furnaces and Settings.
The Council ALSO require the Services of a YARD FOREMAN for their Gas-Works. He must possess a thorough knowledge of Gas-Works routine, indoors and outdoors, and of Gas-Fitting, and be able to control the Workmen. Wages 40s. per week.
The make of Gas is about 43 Million cubic feet per Annum.
Applications, stating Age, Experience, whether Married or Single, accompanied by Two recent Testimonials, and endorsed "Gas Foreman," to be sent to the Town Clerk, Abergavenny, not later than Sept. 16, 1903.
J. T. RUTHERFORD,
Town Clerk.
Town Hall, Abergavenny,
Aug. 15, 1903.

WANTED, an Experienced Draughtsman to Design and Estimate Gas Apparatus.
Apply, stating Age, Experience, and Salary required, to WILLEY AND CO., Engineers, EXETER.

WANTED, Gas Carbon, in Four Ton Lots or more, f.o.r. Must be Clean and Hard Lumps.
Address No. 4044, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Second-hand Gas-Meter, complete, in thorough repair, to pass 50,000 cubic feet per hour, with guarantee of accuracy.
State full Particulars and Price to the BRYMBO STEEL COMPANY, LIMITED, near WREXHAM.

WANTED, a good Second-hand 8-inch GOVERNOR.
State Price and full Particulars as to make and Condition to No. 4077, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

TAR Distilling Works on Sale. Well-established business, large Connection, and Good Contracts.
Address No. 4083, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD, a Letheby Photometer, Edinburgh Model, with Dibdin 10-candle Pentane Apparatus, by W. Sugg and Co. Quite new; never having been fully used. If preferred, a candle-scale beam can be substituted for Pentane.
Apply to J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—One Gas Exhauster and ENGINE combined, by Tangye, for 10,000 to 15,000 cubic feet per hour. Good, Cheap.
Three EGG-END BOILERS 30 ft. by 5 ft., suitable for Tar or Liquor Tanks. Good.
One 5 feet MORTAR MILL, by Smedley. Good.
One 3 cwt. STEAM HAMMER.
Apply No. 4073, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—50 18 in. by 15 in.
Ω-RETORT MOUTHPIECES, fitted with Tangyes' patent Lids; 6-inch Outlets.
30 18-inch Round RETORT MOUTHPIECES, fitted with Tangyes' patent Lids; 6-inch Outlets.
Three lengths Cast-Iron HYDRAULIC MAIN, with 4-inch Outlet and Valves.
18 6-inch ASCENSION, ARCH, and DIP PIPES for above, with 50 feet of 8-inch Foul Main and Connections complete.
One 8-inch Donkin's VALVES.
For further Particulars, apply to G. M. ROBINS, Gas Offices, Sutton, SURREY.

TO WATER-GAS PLANT ENGINEERS.

THE Town Council of Abergavenny invite TENDERS for providing and erecting at the Abergavenny Gas-Works, a CARBURETTED WATER-GAS PLANT, capable of producing 200,000 cubic feet of Carburetted Water Gas per day of Twenty-four hours.
Persons tendering are to supply complete Specifications, with Plans or Drawings of the Plant which they propose to erect. The Specifications and Plans will be returned to unsuccessful competitors.
Payment will be made by six equal annual instalments, with interest on the balance outstanding at Four per cent. per annum.
A Ground Plan of the Site for the Plant may be seen, and further Particulars obtained, on application to the Manager, at the Gas-Works, Abergavenny.
Tenders, with Specification and Plans, to be delivered to the Town Clerk, Town Hall, Abergavenny, not later than Wednesday, the 26th of August, 1903.
The lowest or any Tender not necessarily accepted.
J. T. RUTHERFORD,
Town Clerk.
Aug. 4, 1903.

DEVONPORT GAS-WORKS.

CONTRACT No. 8.

THE Corporation of Devonport are pre-pared to receive TENDERS for the supplying and laying of CAST-IRON MAIN PIPES, VALVES, and APPENDAGES at their Works.
Copies of the Drawings can be seen on and after Wednesday, the 5th of August, 1903, at the Gas-Works Offices, Devonport, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.
Copies of the Specification, with Tender and Schedule of Quantities attached, can be obtained from the abovementioned on payment of One Guinea, which will be returned on receipt of a *bond-fide* Tender.
The Corporation do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, in accordance with the Instructions at the head of the Tender, are to be delivered to the Town Clerk, Devonport, not later than Saturday, the 29th of August, 1903.
(Signed) SIDNEY E. STEVENSON,
Engineer and Manager.
Gas-Works, Devonport.

STRATFORD-ON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 5000 Tons of GAS COALS, to meet their requirements during the ensuing Twelve Months, ending Sept. 30, 1904.
Forms of Tender will be supplied and full Particulars given upon application to
J. S. CRANMER,
Manager.
August, 1903.

CANNOCK, HEDNESFORD, AND DISTRICT GAS COMPANY, LIMITED.

THE Directors of the above Company invite TENDERS for the surplus TAR and AMMONIACAL LIQUOR for Nine Months or One Year and Nine Months commencing Oct. 1, 1903.
Sealed Tenders, endorsed "Tender for Tar and Ammoniacal Liquor," and addressed to the Chairman, must reach the Office not later than Sept. 3, 1903.
Further Particulars may be obtained from the undersigned.
T. A. NICHOLLS,
Secretary.
Gas-Works, Cannock.

CITY OF BIRMINGHAM.

THE Gas Committee of the City of Birmingham invite TENDERS for the purchase of the Surplus TAR to be produced at their Saltley, Nechells, Windsor Street, and Swan Village Works during the Five, Seven, or Ten Years commencing the 1st day of July, 1904.
Forms of Tender may be obtained from the undersigned on payment of One Guinea (which sum will be returned on receipt of a *bond-fide* Tender), and Tenders must be delivered to me not later than the 30th day of September next ensuing.
G. HAMPTON BARBER,
Secretary.
City Gas Offices: Council House,
Birmingham, Aug. 5, 1903.

BOROUGH OF LEIGH.
(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the above Corporation invite TENDERS for the LAYING of a 16-inch WATER-MAIN.
The Drawings may be seen and Form of Tender and Specification may be obtained, from Mr. James Gibson, Gas and Water Engineer, Leigh, Lancs.
Sealed and endorsed Tenders must be delivered to the undersigned on or before Twelve o'clock noon, on Saturday, the 22nd day of August, 1903.
The Corporation do not bind themselves to accept the lowest or any Tender.
By order,
PEREGRINE THOMAS,
Town Clerk.
Town Hall, Leigh, Lancs.,
Aug. 7, 1903.

THE Directors of the Keswick Gas Company invite TENDERS for the supply of 1400 Tons of best screened GAS COAL or NUTS, to be delivered at Keswick Railway Station, between the 1st of September, 1903, and the 1st of July, 1904, in such quantities and at such times as may be required.
Tenders, stating Price per Ton in Contractors' own Waggons, and in the Company's Waggons, and endorsed "Tender for Coal," to be sent to the undersigned not later than the 25th inst.
No Form of Tender supplied.
The Directors do not bind themselves to accept the lowest or any Tender.
J. H. BRODIE,
Secretary.
Main Street, Keswick,
Aug. 7, 1903.

CLACTON URBAN DISTRICT COUNCIL.

THE above Council invite Tenders for the supply and delivery of about 3500 Tons of best screened GAS COAL at Clacton-on-Sea in quantities as may be required during the ensuing Twelve Months.
Particulars and Form of Tender may be obtained upon application to the Engineer and Manager, Mr. Sydney Francis, Assoc.M.Inst.M.E., Town Hall, Clacton-on-Sea.
Tenders, sealed and endorsed "Tender for Coal," to be delivered to the undersigned not later than Four o'clock p.m. on Wednesday, the 26th day of August next.
The Council do not bind themselves to accept the lowest or any Tender.
GEO. T. LEWIS,
Clerk to the Council.
Town Hall Buildings,
Clacton-on-Sea, Aug. 12, 1903.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY

SALE BY TENDER OF £35,000 THREE-AND-A-HALF PER CENT. DEBENTURE STOCK.
MINIMUM PRICE, £100 PER CENT.

NOTICE is Hereby Given, that the Directors will SELL BY TENDER £35,000 of THREE-AND-A-HALF PER CENT. DEBENTURE STOCK, to be issued under the Provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901.
Particulars and Forms of Tender may be obtained on application to the undersigned; and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 25th of August, 1903.
The Stock will be allotted to the highest Tenderers; but no Tender will be accepted at a lower price than par.
By order,
THOMAS WADDOM,
Secretary.
Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, Aug. 5, 1903.

BRIGHTON AND HOVE GENERAL GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the Company will be held at the Company's Offices, No. 5 ,Great Winchester Street, Old Broad Street, London, on Friday, the 4th of September, 1903, at Two o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1903, to declare Dividends, to elect Auditors, and for other Purposes.

The TRANSFER BOOKS OF THE COMPANY WILL BE CLOSED from the 22nd of August to the 4th of September, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

5, Great Winchester Street,
Old Broad Street, London, E.C.
Aug. 14, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

SALE BY TENDER.

HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LTD.

SALE OF SHARES, &c., BY TENDER.

IN PURSUANCE OF THE HOYLAKE AND WEST KIRBY GAS AND WATER ORDER, 1900,

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL by TENDER not more than 400 NEW ORDINARY "B" £5 SHARES, applicable to the Gas Undertaking only, and not more than 1600 NEW ORDINARY "B" £5 SHARES, applicable to the Water Undertaking only. The new "B" Shares in the Gas Capital are subject to the Sliding-Scale, with a Standard Dividend of 7 per Cent., while the New "B" Shares in the Water Capital may rank for Dividend up to a Maximum of 7 per cent.

The Directors also invite OFFERS to ADVANCE the sum of £500 upon security of the Gas Undertaking, and the sum of £2000 upon security of the Water Undertaking.

Forms and Conditions of Tender may be obtained from the undersigned, to whom sealed Tenders must be delivered not later than Ten a.m., on Wednesday, the 9th day of September next.

By order of the Board,
A. G. READDY,
Secretary.

Registered Offices:
5, The Quadrant, Hoylake,
Aug. 10, 1903.

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

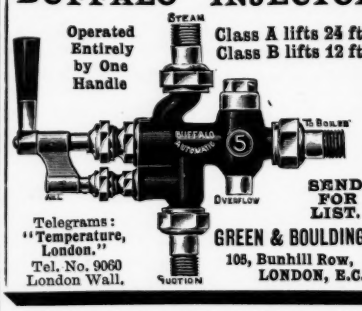
Offices: **28, Victoria St., Westminster.**
Works: **10, Rochester Row, S.W.**

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
Inquiries Solicited.
Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

TROTTER, HAINES, & CORBETT,
Brettell's Estate LIMITED,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: R. CULL, 84, OLD BROAD STREET, E.C.

Asbestos
We don't know whether you use
ENGINE AND CUP GREASE,
but if you do you must test
AMIANTHOLS.
None like them have ever been known.
Ask for No. 6 Catalogue.
Applications for Colonial & Foreign Agencies invited.
CRESSWELL'S ASBESTOS CO., LTD.,
Wellington Mills, BRADFORD, Yorks.
Telephone 950. *Telegrams:* "*Asbestos, Bradford.*"

'BUFFALO' INJECTOR
Operated Entirely by One Handle
Class A lifts 24 ft.
Class B lifts 12 ft.


SEND FOR LIST.
Telegrams: "Temperature, London." Tel. No. 9060 London Wall.
GREEN & BOULDING,
105, Bunhill Row, LONDON, E.C.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
Also Removal of last Traces of
SULPHURETTED HYDROGEN
in catch position.
Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— LIMITED, —
1, FENCHURCH AVENUE, LONDON, E.C.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on Application.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY
RAVENSTHORPE, NEAR DEWSBURY.

THE
"ROTARY"
STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE, MANCHESTER.

THE SILICA FIRE-BRICK COMPANY,
OUGHTIBRIDGE, near SHEFFIELD.
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

THOMAS TURTON AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

THE WELSBACH KERN SELF-INTENSIFYING SYSTEM.

No. 604.

No. 35a.

The name **Welsbach** is our guarantee of quality, and a protection against disappointing results.

35a **SHADOWLESS LANTERN** (**500** in use in **NEWCASTLE-ON-TYNE**).

604 **SUSPENSION S.I. LAMP** (Interior Lighting). Enamelled throughout—**No Paint used.**

Both Lamps are produced in three sizes, giving about

150 Candle Power for 5 feet of Gas per hour.
300 " " " 10 " " " "
600 " " " 20 " " " "

Write for Catalogue of New Patterns.

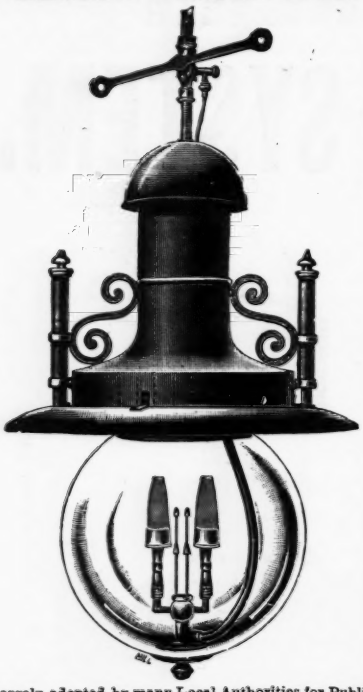
THE WELSBACH INCANDESCENT GAS-LIGHT CO., LTD. (AND REDUCED),

14, PALMER STREET, WESTMINSTER, S.W.

Telegrams: "Welsbach," London. Telephone: 290 Westminster.

THE PATENT

"BEACON" GLOBE LAMP.



Largely adopted by many Local Authorities for Public Lighting, being absolutely Shadowless and Wind-proof.

H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1698 HOP.
Telegrams: "LUMINOSITY LONDON."

REDUCE EXPENSES, INCREASE PROFITS by doing your own Whitewashing or Limewashing.

THE
"EVERTRUSTY"
PNEUMATIC PAINTING, WHITE & LIMEWASHING MACHINE.
Extract from a Recent Inquiry: "I have seen the Machine which you supplied to the Bradford Road Gas-Works, Manchester, with which the Manager there is very highly pleased."

Cost from £3 10s. to £12 10s. "A" size replaces 25 men.

Full Particulars on application to

WALLACH BROS.,
67, GRACECHURCH STREET, LONDON, E.C.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

THE "MENIER"

AUTOMATIC LIGHTER.

7000 in Use in Brussels.

12,000 in France and Belgium.

Patented in England, Germany, &c.
For description, see "JOURNAL" No. 2086, page 295.

LANTERNS in Cast Iron and Copper for Incandescent Gas Lighting.

Cie. Belge pour la Fabrication des Compteurs et Matériel Gaz, Eau, Electricité,
127-129, rue des Palais, Bruxelles.
For Catalogues and Particulars, apply to
Agents: WILH. LÜTTGE, Ltd.,
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Which is a Complete Catalogue of BURNERS, MANTLES, and GLASSWARE, and contains some

IMPORTANT REDUCTIONS IN PRICES

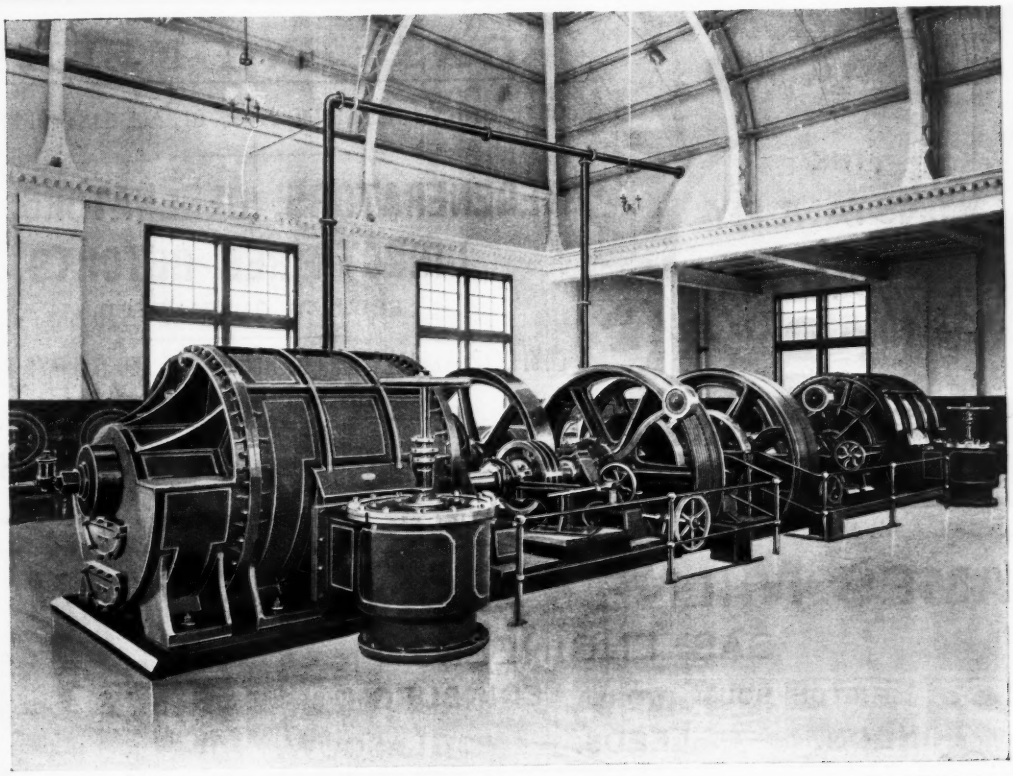
Of "JENA" Glass.

JUST PUBLISHED. *POSTED FREE ON RECEIPT OF TRADE CARD.*

FALK, STADELMANN, & CO., LIMITED,
"VERITAS" LAMP WORKS,
83, 85, & 87, Farringdon Road, London, E.C.

R. LAIDLAW & SON, LIMITED

GAS & WATER ENGINEERS.



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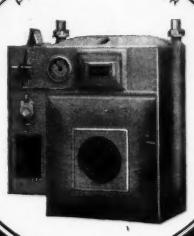

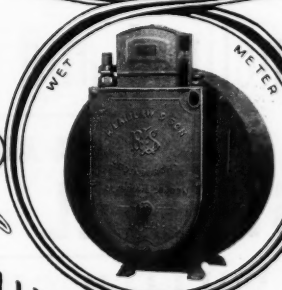

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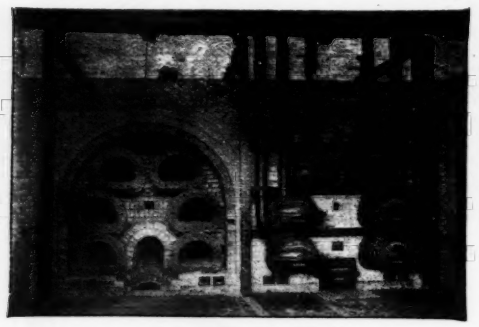

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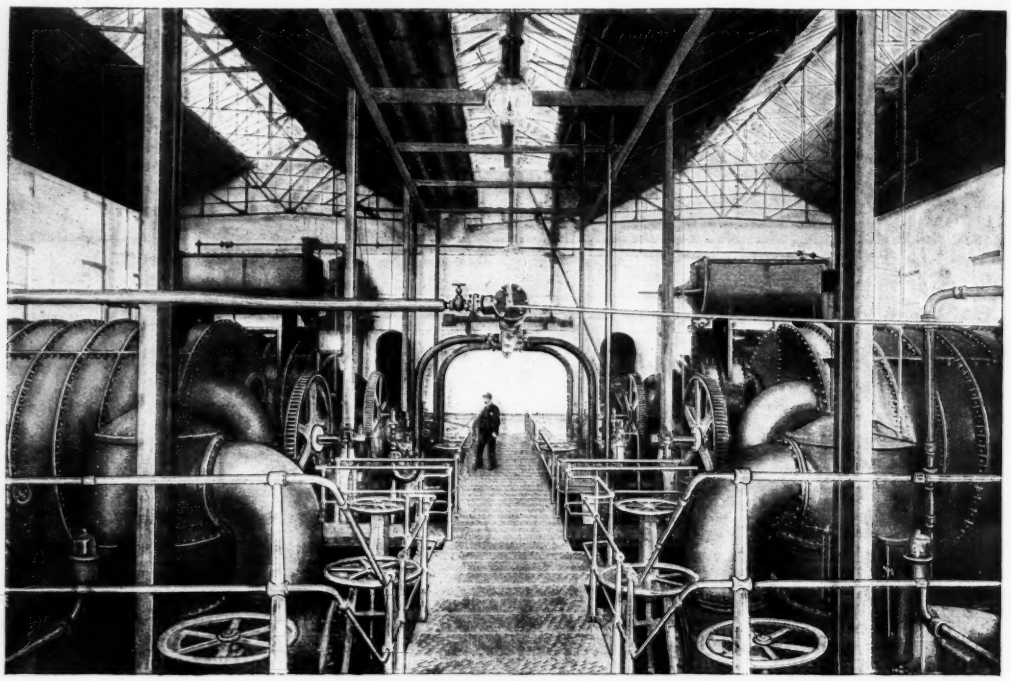

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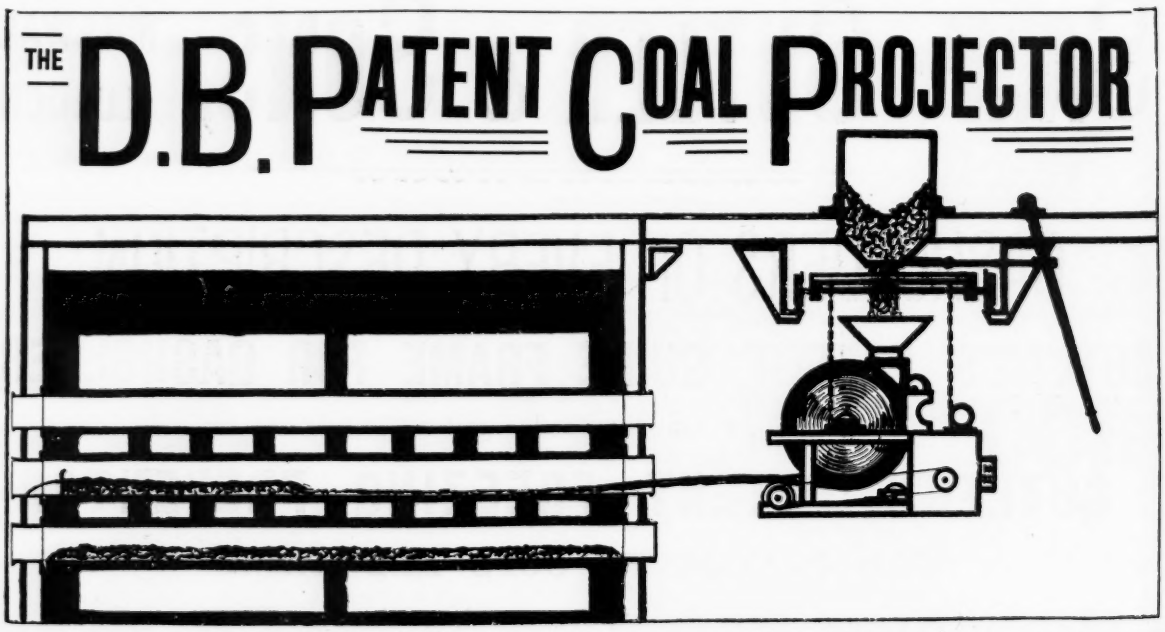

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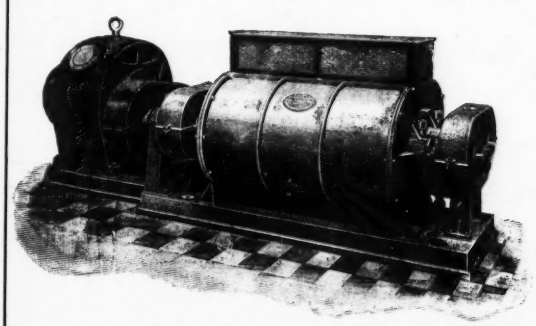

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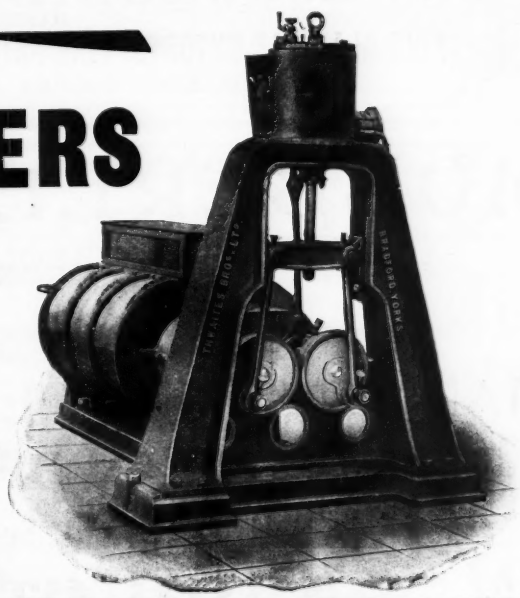

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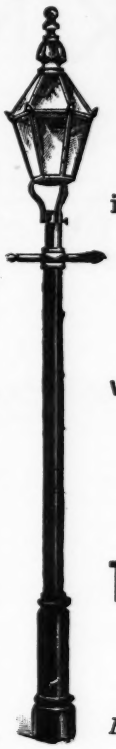

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